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THE

JOURNAL OF AGRICULTURE.

WHAT MAY NOW BE DONE FOR SCOTTISH AGRICULTURE?

By James F. W. Johnston, F.R.S.L. & E.

In passing across an extensive tract of country, the traveller finds the means of transport and the rapidity of his advance to vary with the natural features of the district in which he happens to be, with the intelligence and wealth of the people, and with the skill they have attained in the various arts of life. At one time it is necessary to proceed on foot, at another to travel by diligence; now to skim along a railroad, and now to glide down some tranquil river, or to stem its fretting waters with the overmastering power of steam.

So it is with agriculture—whether it silently advance, and, as it were, by its own spontaneous movement, or be fostered and helped forward by timely and judicious patronage. The means by which it is best promoted, and the rapidity of its progress, are affected by the natural features of the country and by the character and attainments of its rural population.

It is under this impression that, after having on a former occasion, in a letter to the Marquis of Northampton, endeavoured to reply to the question, "What can be done for English agriculture?" I now address myself to the inquiry—What may now be done for Scottish agriculture?

To the European ear it will not sound strange that these two questions should be regarded as admitting of separate discussion, and even of somewhat different answers. In foreign countries, Scottish agriculture has the reputation of being the best in the empire, and Scottish customs, and the agricultural literature of Scotland, are familiar to the improving husbandman in almost every part of the world. On the shores of the Seine, the Rhine,

and the Elbe, the traveller will hear of the opinions of Scot farmers—on the banks of the Danube, the Wolga, and the N the Durham short-horn and the Scottish plough will meet familiar eye on almost every skilfully-cultivated spot; while the river St Lawrence and the lake coast of Canada, the Scot tiller has found a home for the customs of his fatherland, as adapted to the climate of his new country.

Nor even to the British ear will it seem remarkable that two questions should be held in some measure distinct, if position which agriculture holds, and the general character of agricultural population in the two divisions of the island, l been well seen and considered. No general statement, it is t can be made in regard to either end of the island which not admit of many exceptions. There are practical farmer, skilful, portions of the agricultural body as intelligent, and as well cultivated, to the south of the Tweed as can be foun the north of that accidental boundary; nevertheless there general persuasion, and I believe a well-founded one, even am ourselves, that, in all these respects, Scotland, as a whole, is co derably in advance of England as a whole. If this be so, v may be best done to promote its further advance in the country may not be the most likely to succeed in the ot But the following considerations place this matter in a cle light.

In a country where the rural population has in general rece the rudiments, at least, of a sound elementary and religious ed tion—where a natural intelligence sparkles in the eye of humblest labourer—where the book-shelf is seen in every farn house, and the desire of knowledge, instead of requiring ex ment, needs often to be restrained—where a natural persevera only stimulated by obstacles, does not suffer the farmer to succ to the natural difficulties of situation and climate, but in him, rather by recurring to his task, finally to overcome the where a lurking spirit of adventure urges to the trial of methods, and yet a proverbial caution, restraining from im dent attempts, makes his advance more *sure* though s Among such a population, the means that must be taken for improvement of practical agriculture may be simpler and r easy of adoption than where education is deficient, intellig dormant, ambition unawakened, the spirit depressed or bro and prejudice impregnably intrenched behind the bulwarks o and long-prevailing custom.

Again, in a country where the efficacy of the furrow-drain the subsoil plough are no longer matters of doubt or inquiry—w landlord and tenant are equally employed, and at a great exp in securing these improvements to their farms—where so

sound knowledge is generally diffused as this fact implies—the agricultural population must be prepared for another order of instruction and for other means of diffusing it than where the twelve-inch drain is still held sufficient, and where it is still doubted if apparently sound land ought ever to be drained at all.

I may add, further, that where a system of leasehold tenure prevails, of which landlord and tenant both equally approve—where the latter is, in consequence, sure of a return for the money and labour he expends upon his farm—where the advice of the landlord, when it relates to improvements, is not suspected to have a more or less immediate relation to an increase of rent—and where, no jealousy existing between them, the interest of the landlord and tenant is seen to be really one and the same. In such circumstances, many of those obstacles are unknown which elsewhere stand in the way of agricultural improvement. The mind of the practical farmer is more open to the reception of good advice, and to the adoption of sound and well-considered measures. His own interest is identified with the increase of the produce of his land, since he is himself to receive the immediate and, perhaps, the greatest benefit of that increase.*

These general considerations might sufficiently justify me in regarding the question from different points of view, and thus appearing to separate the really united interests of agriculture in the two ends of the island. But there is one other circumstance which has mainly induced me to select the special title which I have prefixed to the present paper.

The recent establishment in Scotland of an association for the special prosecution of *scientific* agriculture,† originating with practical farmers, and afterwards supported by their landlords throughout the country;—this is a feature of the time so very striking—one so honourable to the country, and especially to the parties with whom it has originated—so strongly indicative both of the desire of improvement and of the spread of a higher

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* It is often urged against the landowners that they alone are averse to a leasehold tenure, where the custom of yearly holdings prevails. My own experience does not confirm this as, at least universally, true. I have frequently asked the tenants of farms I have visited if they would not prefer a lease, and I have been answered, "No, they do not wish to be bound; if the land is a bad bargain, they can give it up." The fall of prices at the peace, and the fatal consequences that ensued to the holders of leases at that period, are fresh in their recollection, and they are unwilling to expose themselves to the chance of a similar calamity. Yet it is among these yearly tenants, who profess a repugnance to leases, that the jealousy of the landlord prevails most strongly, and the suggestions to improve are most suspected. Between such parties it has often occurred to me that a lease would prove an invaluable *bond of union*.

† "The object of the association being the improvement of agriculture by the application of chemistry, vegetable physiology, and geology."—*Published Statement.*

kind of knowledge among the actual cultivators of the lan that, in connection with it, the questions naturally sugge themselves—What is there to be done for Scottish agricultu in particular? What can such an association hope to effec How are its proposed objects to be most surely and most ful accomplished?

1°. The first thing that strikes the observant tourist in rega to the agriculture both of Scotland and of England, is the unli state of advancement exhibited in different counties, and t unlike amount of knowledge as to the possibility of improveme which prevails among different sections of the rural populati Among the agricultural body, as a whole, he finds an extensi practical knowledge to exist; but heaped up, here and there, as were, in separate hillocks, in different parts of the country, whi if generally spread abroad, would greatly increase the avera skill of the whole body of cultivators, and with it the average p duce also and value of the land. Can anything be done to equal this knowledge—to diffuse it more generally and uniformly, bring up the entire population to the same high standard which some men in some districts have already attained?

This desirable object cannot now, I think, be considered wholly beyond our reach. At the meeting of the Royal Engl Agricultural Society at Liverpool, two years ago, Sir Char Lemon—than whom no one in our time has shewn himself m desirous of promoting the prosperity, mineral and agricultu of his native county—informed me that, at his own expense, had induced two of his best farmers to come from Cornwall the meeting, for the purpose of convincing them that there w some men who really knew more about farming than themselv And at the formation of the Tamworth Farmers' Club, at wh I had recently the honour to assist, it was stated, by Mr Edmu Peel, that Lord Hatherton, whose agricultural improvements most highly commended, had caused some of his tenants to v certain farms in other counties; and that, so satisfied were th that what they had seen was better husbandry than their o that they immediately, and of their own accord, began to impro Here is an idea worth pursuing—a practice worthy of imitatio a means of levelling the general surface of knowledge by rais up the hollows without depressing any of the heights; for kn ledge has in itself this pregnant virtue, that you may take petually from its highest parts without at all diminishing elevation.

But individual example has comparatively little influence the progress of even the best schemes is slow when their ad is dependant upon the conviction of many minds. In the

which are likely to be at the command of the Scottish association, however, I can see a better way of carrying this idea into effect, and of putting within the reach of one man the practical knowledge which other men already possess.

It is the intention of this association to engage a chemical officer, one of whose duties shall be, under certain regulations, to visit different parts of the country, for the purpose of inspecting farms, studying soils, advising experiments, suggesting improvements, and imparting oral information in various forms. In these excursions, let individual farmers, or farmers' sons, members of the association, be invited to join; or let farmers' clubs, or county agricultural societies, appoint some of their number to proceed in this or that direction in which the excursions may be announced to take place. They will accompany the chemical officer—they will listen to his inquiries—they will hear his remarks and suggestions—will learn the reasons on which they are founded—will have their attention drawn to many new facts—will learn how to observe with accuracy, how to collect, and collate, and interpret alleged facts, so difficult an art in reference to practical husbandry—and will enjoy private opportunities of asking advice or explanation in regard to objects, and appearances, and practices, that may come before them. Such men will, of necessity, come home wiser than they went. They will naturally be asked, and will, no doubt, be ready to give to their neighbours, or to the members of their club, an account of what they have seen generally—of what, in their opinion, is better husbandry than they themselves practise, or wherein the customs of their own district appear to surpass those of their neighbours.

Can any one doubt that much good would follow from such a mode of procedure—that more may be done by the ocular inspection afforded in these excursions to many persons at once than by almost any other means? Each one of the party would help to enlighten the others, while the person who was visited would derive little less benefit than those who had come to see his farm.

I never go into a part of the island before agriculturally unknown to me—I rarely ever visit a farm for the first time—that I do not meet with some new practice, observe some new illustration of a principle with which I am familiar, or have some new suggestion presented to my mind, by which either my own knowledge is at once increased or important experimental inquiries are pointed out. Similar good may be expected to follow in the case of others who have learned how to observe. Nay, this kind of instruction, by the eye and the ear, will be the first to make an impression upon many minds; and some who previously were unwilling to read, may return home with the desire of that further knowledge which they can there derive from books alone,

2°. But if the sum of the practical and theoretical knowledge, which is prevalent in the most improved districts of Scotland, be compared with the amount of knowledge actually existing in the writings and minds of those who have made theoretical agriculture their study—it will be found, as a whole, almost as far in arrear as the less skilfully cultivated districts are behind those in which the greatest progress has yet been made in the applications of science to the art of culture.

One consequence of this state of *prevailing*, in reference to *existing* knowledge, is this—that practical men are open to the influence of every new opinion, however practically pernicious, if strongly and confidently expressed, or if supported by the alleged authority of a great name. They are at the mercy also of quacks and adventurers of every class, who have new commodities to vend, and who, either ignorantly or frudulently, deceive the uninstructed farmer, with a view to their own profit.

It is not merely for the purpose of defending the husbandman from the latter class of men that it is desirable to impart to him a portion of the unapplied knowledge now lying dormant in books, but for the purpose also of setting him more free from the control of the mere theorist, whose opinions, untempered by a due acquaintance with practice, might otherwise lead him to the adoption of very erroneous and unprofitable modes of culture. It is to the hasty adoption of new notions by the half-learned, that the losses of incautious improvers—*changers* they ought rather to be called—are mainly to be ascribed, and the consequent bad repute into which experimental agriculture has fallen among the more prudent and wary farmers.

Observe, by one or two examples, into what practical errors the propagation of a mere theoretical opinion may lead. It has been long known that the stems of the corn crops—their straw—contains much silica; and it has been believed, nearly as long, that it is by means of potash or soda, and chiefly the former that silica is enabled to enter into the plant. Upon this opinion Liebig—whose name has recently become so familiar in connection with scientific agriculture—based on explanation of the benefit of naked and green-crop fallows. He broadly announced that wheat grows well in this soil, because it contains much potash refuses to grow in that, because potash is wanting, and that the efficacy of a fallow consists in its allowing the potash of decaying minerals to accumulate in the soil, and thus to provide a sufficiency for an after-crop of corn. What was this, but to say that, by adding potash to the soil, you may grow wheat after wheat for an unknown period? How important, and yet how simple, a discovery this! No wonder that it attracted the attention and excited the hopes even of the more instructed farmers; and that

a kind of potash monomania should have spread among the distressed agriculturists from one end of the island to the other. Then was the flood-gate opened for new varieties of quackery, and every large town speedily produced its own chemical-manure manufactory.

But a very slight examination shewed the unsoundness of this opinion of Liebig. A green crop favours, he says, the after-crop of corn, by allowing the potash to accumulate; and yet, according to the best analysis we yet possess, the two green crops in a four year's rotation carry off from the soil *ten times* as much potash and soda as the two corn crops. Where is the possibility then of accumulation? What becomes of the theory? What of the quack manures? What of the hopes of corn crops in succession? It may produce some ultimate benefit thus to unsettle men's minds; because it will lead some to think, to inquire, and, at last, to make considerable approaches towards the truth; but it causes an immediate pecuniary loss to many, and disgusts more with the applications of science, and leads them naturally to distrust even its best founded prognostications.

Again, in another case, Liebig reasons as follows:—Wheat straw contains about 16 per cent. of inorganic matter, which it leaves, when burned, in the form of ash; barley straw, 8 per cent., and oat straw, 4 per cent.—therefore, "upon the same field, which will yield only one crop of wheat, two crops of barley and four of oats may be grown." From this opinion naturally followed the practical rules—add to the soil those substances contained in the straw, and, if you wish a crop of barley, add twice, or of wheat four times as much as you would add for one of oats. How simple also these rules and practice. What an easy thing to farm land upon chemical principles. Yet the facts from which Liebig's opinion and the practical rules are both deduced are incorrect. There is seldom any striking difference between the quantity of ash left by the three kinds of straw in question, when grown upon the same soil. They all vary, leaving, in general, from 4 to 8 per cent. of their weight. There is nothing then to reason from. How easy, with a little precise information, to remove all foundation for such unsound opinions!

I might quote, as other hasty opinions of a hurtful tendency, the assertion, at first so broadly made by the same author, that the only use of gypsum in agriculture is to fix the ammonia of the atmosphere; and the other, adopted from Sprengel, but not so broadly and distinctly stated, perhaps, that the earthy part of bones is alone of use in promoting the growth of the turnip and other crops. Such statements would not long have led Liebig himself into practical error. Reflection would have modified his opinions before he could have applied them in the actual culture

of the land; but when thrown abroad from the press, the published opinions of such men are adopted at second-hand without examination; it soon becomes the interest of some, as in the case of the potash manures, to propagate and uphold them; they become incorporated with the received and ascertained knowledge even of thinking men; form the basis of new reasonings and researches; and thus lead, in their turn, to other wrong conclusions, which again are capable of giving rise to erroneous practice.*

The chemical world is at present divided in opinion in regard to the fattening of animals. Two hostile parties are contending with each other, and the pockets of the unconscious farmer may be seriously affected according as the one or the other opinion first reach his ears. It is asserted by Liebeg that the fat of animals is formed from the starch of their food, while Dumas and his friends maintain that it is derived from fatty matter already present in what they eat. According to the one view, it is sufficient for fattening, that the food contain an abundance of starch—according to the other, it must contain also substances of an oily character. It is said also, by the former, that the conversion of starch into fat produces heat, and is an effort of nature to keep the body warm when the requisite amount of exercise is

* An interesting illustration of what is above stated may be drawn from some recent agricultural proceedings and discussions in the county of Suffolk. It has become a question in that county whether moistened gypsum, mixed with farm-yard dung, would or would not fix the ammonia supposed to escape during fermentation. With the view of determining this point, Professor Henslow, with admirable perseverance and address, (see his *Letters to the Farmers of Suffolk*,) has induced upwards of fifty different farmers in the county to make a trial of this supposed virtue of the gypsum, by preparing each two similar manure heaps, putting a certain quantity of gypsum into the one and none into the other, allowing both to ferment, and thus applying each to an equal breadth of land, and observing their relative effects upon the succeeding crop. If the gypsumed manure gives a larger crop, the conclusion is to be that the gypsum fixes the ammonia. But this conclusion is not a necessary one, and may be incorrect. It is dependant upon the correctness of the opinion expressed by Liebig, that gypsum acts in *no other* way than by fixing ammonia. But this opinion is not correct, and, therefore, the conclusion drawn from the experiments with manures may be incorrect also. Suppose, for instance, that no more ammonia is retained in the one heap than in the other, still the gypsumed heap will contain a certain quantity of *sulphuric acid* and *lime* (gypsum consisting of these two substances) not present in the other, and if the soil or crop to which it is applied require these substances, the doctored manure may produce a greater effect than the other; it may even be predicted that if the crop be one of clover, beans, or vetches, it will most likely produce a greater benefit. What, then, becomes of the conclusion regarding the ammonia? Again, suppose some ammonia to be really fixed and retained in the gypsumed heap which has escaped from the other, still it will contain, as before, sulphuric acid and lime not present in the undoctored heap. To which of these substances, then, is the effect, if visible, to be ascribed—to the sulphuric acid, to the lime, or to the ammonia, or how much to each? To give even a chance of solving this complicated problem—for it really is such—four heaps at least, will be required, one unmixed, one with lime only, one with sulphuric acid only, and one with the gypsum. How necessary that the data upon which we reason and act should be founded on truth

not given to the animal—that the more the animal rests, therefore, the more fat will be produced from the same weight of food; by the latter, I believe, that rest only enables the animal more fully to extract and appropriate to its use the oily constituents of its food. It is easy to see to what differences in the feeding of stock these opposite opinions—though in themselves purely theoretical—may lead practical men. It is certain that both cattle and sheep lay on more weight from the same food when kept under cover and sheltered from the vicissitudes of the weather; but there is a wide difference between these facts—long known, and by which every skilful feeder regulates the treatment of his stock—and the opinion that rest and starch alone are necessary to make an animal fat. "In accordance with the latter view, which I had heard confidently maintained, I took," said a gentleman to me, "twelve sheep of my flock in similar condition, six I kept under cover, and six in the field, and I fed all with the same weight of the same food; but three of the house-fed sheep died before the experiment was concluded." This experiment may have failed only because it was unskilfully conducted; but it shews, nevertheless, that new theories must be received with caution, and prudently tried and tested, before any serious sum of money is risked on the faith of their being correct.*

The practical man requires protection, then—that protection which, having the practice, a larger amount of elementary scientific knowledge will give him—against the evils into which hasty theorizers may lead him. Science and practice must go hand in hand, since neither the practical man who knows no science, nor the scientific man who knows no practice, is fitted to direct that advance which, at the present, above all previous times, experimental agriculture is prepared to make.

But it is not in this way alone—in the way of protection against error—that the diffusion of hitherto unapplied knowledge will benefit the practical man. There is scarcely a single part of rural economy upon which it will not throw some direct light, or which the possession of this knowledge will not lead the farmer spontaneously to alter for the better. It may not operate suddenly, so as to cause striking changes in every district. It will not, it ought not, to come in as a flood, overturning and altering everything. It may quietly descend, like the dew, or

* Perhaps the bearing of this theoretical question upon agricultural practice is more evident in the case of dairy stock. Whence comes the butter of the milk? Is it extracted ready formed from the food? Then it must be of great consequence to select food which is naturally rich in oily matter. Theory would even say, "Give your cow a quantity of oil-cake if you would enrich her milk and increase her yield of butter." Or is it chiefly formed in the body of the animal by a chemical change produced upon the starch and sugar of its food? Then theory would say, "Spare your oil-cake, give your cow rest, with sweet and mealy food, and her milk may be enriched to an unknown degree."

like the shower in summer, to which men give little heed, yet, like them, may fertilize the whole land on which it falls; it is from this gradual and almost unseen diffusion, which s unconsciously place practical men, as a body, upon a higher in lectual level, that the most extensive and most lasting benefits to be derived.

Can anything now be done to effect this diffusion more rap than hitherto; to hasten the spread of more accurate, more cise, and more scientific principles among the agricultural pc lation at large; to place a higher knowledge within the reacl the more remote as well as the nearer districts—the poorer well as the richer farmers; to present it in an acceptable sh to those who have no leisure for reading, and no love for bo as well as to those who wish to learn, and are inclined to stu

If, for political purposes, oral addresses are considered most effectual means of influencing the popular mind—and if, religious and other benevolent ends, a peripatetic agency is fo the most effective—why should not the same means be useful the dissemination of agricultural knowledge? It is in vain publish books when men refuse to read, or to reason upon pa to those who are unaccustomed to think of what they read; there is something in the fervour of the living voice which dormant spirit cannot withstand, and in personal appeals to understanding which even those unaccustomed to think scarcely be able to resist.

In the proposed peripatetic character of the chemical officer the Scottish association, I see the ready means of accomplishi in part at least, this great good. Stored with all the availa knowledge which geology, chemistry, physiology, and bot have yet supplied, he will, as a part of his regular duties, vi now in this and now in that district of the country. He lecture in public and converse and instruct in private; and th by inocculating a few here and a few there, will form so ma smaller centres from which knowledge shall gradually circul among all. And if much time must elapse before all parts Scotland can in this way be visited, yet the volunteers and de ties I have supposed to accompany him will lessen in part t unavoidable difficulty, by carrying the advantages of each c versation and address to the more distant parts of the countr

Can it be doubted that by such means sound knowledge m be diffused among the agricultural classes more rapidly than any method ever hitherto tried? It is true that lectures up science are occasionally given in the provinces; but why lea them to the chance of a stray visitor, or to that of imbibing wro notions from a half-instructed lecturer? Even were such instr tion generally provided in our universities, why should those

debarred from sharing in it whose circumstances do not permit them to repair to those distant fountains? Why, especially, should this be the case in reference to a subject so important as the culture of the land, and in the case of a body of men so invaluable to the State as those to whom this culture is intrusted?

It will not be considered as an unimportant consequence of this mode of procedure, that the association itself will be supported and strengthened by it—the objects it has in view, more fully brought out and appreciated—and its influence for the benefit of agriculture extended even beyond the limits of the country in which it has taken its rise.

Is the half of Scotland yet awakened to the connection between science and agriculture—to the benefits which the former already has conferred, and promises in future still more to confer, upon the latter? Will they soon awaken to it, or will they awaken of themselves? I know of nothing so likely to rouse them as the sound of the living voice.

3°. But what is actually known, even by the most learned, is still greatly less than that which remains to be acquired. How many questions are there which the practical man may ask, and which the possessor of all our present theoretical knowledge cannot satisfactorily answer? How many questions suggest themselves to the mind of the student in theoretical agriculture, which he records as subjects of future experimental investigation; for which, if time permit, he may wish himself to find solutions; or to which he may anxiously wish to persuade others to seek for answers by laborious chemical research!

Can anything be done to promote this higher branch of the agricultural art—to develop more fully its scientific character—its connection with and dependance upon science—to test prevailing theories—to get rid of unsound notions—to clear away the mists and difficulties which beset so many branches of the subject—to enclose a portion of that unmapped debatable ground upon which our theoretical pioneers make their hasty and too often random excursions—to establish, in short, a rational agriculture on the sound basis of experimental induction?

I cannot express the gratification I have experienced in finding that this higher branch has not been lost sight of by the Scottish association. It may indeed be considered as the most remarkable circumstance in connection with the agriculture of our time—it is certainly one which, in the eyes of other countries, will tend, more than almost anything else could, to uphold the high estimation of Scottish farmers and Scottish farming—that a voluntary association of the practical cultivators of the soil,

undirected by influence from without, unaided at first by the cou tenance of the principal owners of the soil—should have been s alive to the actual state and to the wants of scientific agricultur and so impressed with the benefits which its further advanc ment would confer upon themselves, and upon the art by whic they live, as to raise a fund, from the produce of their own industr for the prosecution of purely scientific investigations.

It does appear, indeed, as if the school-master had bee abroad to some purpose—as if the middle classes at least, in tl rural districts as much as in the towns, had felt his influenc and, seeing the practical bearing of the newer branches of kno ledge, were determined to proceed in advance of the older unive sities, and of those educated within their walls—to establish, f themselves, those means of scientific instruction which the ancie seats of learning do not afford—and to give that aid and count nance to useful scientific research which is sought in vain amo those who have been trained under, and who now direct, tl usual limited course of academical study.

The establishment of an association with views so enlighten is valuable, not merely for what it will itself be able to effect, b as an index also of what must soon be done for agriculture in tl other divisions of the empire.

As I understand his duties, the officer of the association, havi his residence, for a certain number of months, in Edinburgh, is make analytical researches in his own laboratory; to propou agricultural queries to practical men, and experiments to l made by them in the field—the laboratory of nature; to indica the precautions which must be taken to render their experimen satisfactory; to interpret and compare, and, so far as can be don to generalize the results which may be obtained; and to have h laboratory open for the reception of pupils who are desirous learning the art of cautious and accurate experimenting, of pr pounding definite questions to be solved, and of carefully a prudently putting these questions to nature, that she may be i duced to solve them.

How many failures have arisen, and how much odium has be unjustly brought upon experimental farming, because of the ra manner in which it has been too often conducted! The proble to be solved by the experiments made has not been clearly unde stood, definite questions have not been proposed, all the circu stances necessary to ensure success have not been understoo the method of drawing fair deductions from what is seen to ta place has, from want of practice, been imperfectly known, or, whi has not proved the least injurious, the experimenter has not be sufficiently alive to the value, the necessity rather I should sa of economy in everything, in time, in material, and in money.

I have elsewhere so frequently urged the importance, to the real advance of the art of culture, of experiments made in the field, in which all the circumstances should be carefully observed and recorded—and the results I have been enabled to publish,* have so fully confirmed the opinions I had expressed, that I will only remark, in this place, that too much good can hardly be anticipated from the prosecution of such experiments under the auspices of the association.

4°. It is the character—perhaps it may be called the consequence—of the improving agriculture of the present day, that easily portable manures of various kinds, natural and artificial, are beginning to be employed in almost every part of the country. Hence have arisen manufacturing establishments, in most of our great cities, for the preparation of artificial manures. Articles of known composition also are imported or compounded and announced for sale from various quarters. Patents are taken out for *especially* valuable fertilizers, as the patentees consider them, whilst almost every manufacturer has some secret mixture of his own, which is more or less broadly announced as the best, the cheapest, and the most unfailing manure for every species of crop. But, among many valuable articles, there must, certainly, be much that is worthless also. Many of the announcements must be pure quackery, fitted only to lead the practical farmer astray, and to cause him loss both of money and of crop, while many substances, even of known composition, are sold to the farmer in a mixed or adulterated state.

If any practical good is to result from the agricultural experiments which are hereafter more numerously to be instituted, any practical rules to be deduced from the observations which shall be made, it can only be by the employment of substances which are uniform in composition, and which, therefore, may be expected to give uniform results, that is to say, *by the use of substances of known composition only, and of the same degree of purity*. To secure this end, there ought to be some recognised authority, some *friend*, to whom the farmer should have a right, and to whom he could in confidence apply, and from whom, at a nominal cost, he should be able to obtain an opinion as to the purity and commercial value of the substance he may wish to purchase as an application to his land. This friend the farmer will hereafter find in the *chemist* of the association. It will be his duty to protect the members of the body from the impositions of ignorance and of fraud. The mere knowledge of his appointment, will alone prevent many adulterations; the announcements of quack manures will become

* See *Suggestions for Experiments in Practical Agriculture*, Nos. I. II. III. and IV. published by Blackwood.

less frequent; the value of the experiments by which their efficacy is said to be proved will be criticized and tested; the manure manufacturer will become to the practical farmer what the retail druggist is to the invalid—*a mixer of ingredients of known composition, in known and prescribed proportions.*

Among other analytical work which the chemist is to undertake, much weight is attached by some to the analysis of soils. But the rigorous analysis of a soil is one of the most difficult problems of its kind which the chemist in his laboratory can be called upon to solve, and one which requires the longest time. Were he to do nothing else, he would be an industrious experimenter if he should faithfully analyze thirty or forty soils in a year. It is necessary therefore to balance this expense of costly time against the value of the analyses when made, and to consider whether more good could not be done by employing the same time in a different manner.

An apparently very simple method of improving the soil, and one which at first sight seems strongly to recommend the prosecution of refined analyses, is founded upon the following mode of reasoning. Take two soils, one fertile, one more or less unproductive, analyze the former, and you see what a fertile soil contains, analyze the latter, and you see in what it is deficient; add these defective substances to the unfertile soil, and, making the two soils alike, you will make them equally productive. But supposing that, when thus mixed, the two soils *would* prove equally productive—which is by no means a necessary consequence—there are so many causes of diversity in the samples of soils which may be collected, that the result of an analysis can rarely be trusted to as indicating what the soil is actually in want of. In different parts of the same field samples so different may sometimes be unconsciously gathered, that a rigorous analysis of any one will fail to exhibit the general constitution of a whole field; while, if the expedient be adopted of mixing a variety of samples, the analysis of the mixture will give the composition of no part of the field whatever. Soil gathered from the same spot also is liable to such diversities, that, if collected at one season, analysis may say it abounds in a given substance, while at another it may find the same substance wholly awanting.

In summer, for instance, when the hot sun draws up the moisture from the soil, it rises from beneath, bringing with it whatever soluble substances it holds in solution. But, when it reaches the surface, it evaporates, and leaves these behind it; and upon some spots these substances accumulate so much, in a hot summer, as actually to form a white saline crust upon the surface of the soil. Collect the soil at this period, and the chemist will pronounce it to abound in a remarkable degree with sulphate of soda, or sul-

phate of magnesia, or sulphate of lime, or sulphate of iron, or sulphate of alumina, or common salt, or chloride of calcium; and whatever bad qualities the soil was known to possess, he may ascribe to the excess of these or other soluble substances he has found it to contain. On the other hand, collect it after a season of washing rains, and—especially if the soil be light—scarcely a trace of the same soluble substances may be found in it; and thus chemistry might bid the practical man to add to his land what it already abundantly contained.

Such difficulties lying in the way of collecting soils which can be considered as average samples of a whole field, and at every season of the year, it is obvious that much uncertainty must attach to the results of analysis, both in regard to the constitution of fertile and of unfertile soils; and that he who founds upon this basis alone his prescriptions for improving the condition of the land, may often form erroneous opinions himself, and may induce practical men to incur expense which can lead to no sensible good, and may actually diminish the amount of his crops.

Yet the analysis of soils, in a certain sense, and with a view to certain special objects, is neither worthless nor deserving of neglect. One soil, by an easy examination, is found to be deficient in organic matter, and the advice may be—try the ploughing in of a green crop; another may contain much vegetable matter in what is called an inert state—try upon that a dressing of hot lime; a third may contain sulphate of iron or alumina—drain, deep plough, lime, (or marl,) and summer fallow such land, and you take the shortest road towards a cure. Again, one may ask, Why does lime not benefit my land? An easy analysis will reply, because it abounds in lime already, and must have a season of rest from liming, or because it is poor in organic matter, and requires more liberal supplies of manure; or, if neither of these is the case, because your land requires draining. So the subsoil may be yellow and noxious when brought to the surface, or it may kill the roots of plants when they descend to it. Then a simple examination may prescribe draining and subsoiling, that the noxious matter may be washed out by the rains, and the whole mellowed by the admission of the air. Or it may be rich in lime, which has sunk from the surface, and, after frequent limings, has produced a real marl bed beneath, affording a congenial harbour to the pestiferous coltsfoot; and here the chemist may say, plough your land deep, and bring up the marl, and you will both save the cost of lime for a season, and will rid yourself of a troublesome weed.

Such are a few of the cases in which a comparatively simple chemical examination, by one versed to some extent in practice

also, will, at no great cost of time, lead to valuable practical results. To these, I think, rather than to the more refined analysis of soils, the attention of chemists ought at present to be mainly directed, if the object be to render these researches practically useful in the greatest degree.

But there is another class of refined chemical analyses, to which the same objections do not apply, from which, though not perhaps, to all so obviously, yet more certain and general good is sure to flow. These are the analysis of the ash of plants.

A few short and simple steps of reasoning connect the constitution of the ash of plants with the practical culture of the land. When any portion of a crop is burned, a quantity of ash remains behind. In this ash a certain number of substances is always present. These the plant draws from the soil, and it does not grow in a healthy manner, nor attain to full maturity, unless it can readily obtain them. The soil, therefore, must contain them all, if a green crop is to flourish upon it. If one be absent, the practical farmer must add this one before his land will satisfy his wishes. If he is in doubt as to which of the constituents of the ash he ought to add, he may in extreme cases discover it by analysing his soil; but in many cases the appearance and quality of the crop, or of the weeds that grow upon his land, will help him to his object without the necessity of an analysis of the soil. Thus the weakness of the straw in bog-oats indicates that the roots do not send up silica fast enough to supply the necessary wants of the growing stem—and when wheat and barley crops are readily laid, a similar deficiency is shewn. On such soils, therefore, applications which will increase the supply of silica are indicated, while such as hasten the growth and increase the bulk of the straw are forbidden. Or if, again, plants spring up naturally, such as the bugloss, (*Echium vulgare*,) and corn gromwell (*Lithospermum arvense*,) which contain much silica, and are known to grow where there already exists in the soil an ample supply of this substance in a state fit for entering into the roots of plants then those manuring substances which promote the general growth of plants may be safely applied to the land, without the risk of the corn being laid, while it would be a waste on the same spots to apply those which are fitted to afford silica alone.

But our knowledge of the ash of plants, connected so closely though it be, both with theoretical and with practical agriculture is very incomplete. The quantity of ash left by different specimens of the same plant is unlike. What amount of difference may exist, without affecting the health of the plant? How much of this difference is due to the soil, to the climate, to the mode of culture, and to the variety of plant grown? The quality, also, or nature of the ash varies. Within what limits does it vary in

healthy plants of the same species? What earthy or saline substances are essential to the existence, what to the luxuriance, of each of our most important cultivated plants? Let us know what each crop *must* have, and we shall know what the soil *must* contain, or what we must do to make it capable of growing the crop we wish to raise.

A more profound study of the ash of plants, therefore—a series of refined analyses, perhaps repeated series of such analyses—will be necessary before refined analyses of the soil will acquire their full value. To this branch of the subject, therefore, the attention of the skilful agricultural chemist will, as it appears to me, be at present most usefully directed.

5°. But the several points to which I have alluded do not comprise all which may now be done in Scotland for the advancement of general and local agriculture. Much knowledge will necessarily be diffused during the excursions of the chemical officer, and much by his correspondence when resident in Edinburgh; but a desire also will be awakened in the minds of many for a more complete course of agricultural instruction than these can give. There are already also very many of the more intelligent and improving of the Scottish farmers who would willingly avail themselves of such a course of study for the education of their sons, if the means were placed within their reach.

It is a remarkable circumstance, in connection with the educational institutions of the British empire, that there are none of an academical character which have been established for the sole benefit of the agricultural population—none which even professes to impart that species of general instruction which is especially adapted to the wants, and fitted to promote the pursuits, of the cultivators of the soil. Even in the newer universities the special education of this body of the people is entirely unprovided for. England has its single Professor of Rural Economy, (in Oxford,) without a class. Scotland its Professor of Practical Agriculture, attended, I believe, by a respectable number of students—and to the united agency of the Highland and Agricultural Society, and of the professors who have successively filled this chair, much of the skill of the present race of Scottish farmers is, no doubt, to be ascribed. But a regular course of agricultural instruction is nowhere to be obtained in the British islands.

Various attempts have recently been made on this side of the Tweed to supply such a course of instruction; and it is to be hoped that the time is not distant when the friends of agricultural improvement will succeed in overcoming the difficulties which have hitherto stood in their way. But it seems to me that the establishment of such a course of study is at present within the easy reach of the body of Scottish farmers. The chemical

officer of the association is to reside at least four or five months of the year in Edinburgh. During the three dead months of winter, let him deliver a connected course of lectures upon scientific agriculture. This would interfere but little with his other duties. A course of fifty or sixty lectures would carry him over the whole subject. These might be delivered in two months; but it would be better to spread them over three, giving thus more time for reading to the students, and for digesting the instruction they might receive. By this simple arrangement there would already be accessible to the young farmer, on repairing to Edinburgh during the months of winter, when no outdoor work can be done at home,

1*st*, Lectures on *Practical* Agriculture, on Agricultural Implements, and the Feeding of Stock, by Professor Low.

2*d*, On *Scientific* Agriculture, by the Officer of the Association.

3*d*, On Veterinary Surgery, by Professor Dick.

And to these it would only remain to add elementary lecture on the Botany, chiefly of cultivated plants, to form an almos complete course of instruction upon those branches of scienc which chiefly interest the farmer.

Such an arrangement is open, I think, to no serious objection It would interfere with no existing interest. It would rende more extensively useful the valuable lectures of Professor Low by inducing greater numbers of those interested in agriculture t repair to Edinburgh for the benefit of the more enlarged means c improvement—and it would much aid and promote also the othe objects of the association. To those who had been intereste and partially instructed by addresses and conversations in th provinces, it would afford the means of completing, in som degree, the knowledge they had already acquired, and of thu becoming more extensively useful in their own districts; and i would every year send over the country a number of arden young men, impressed with the value of accurate experiment and taught to conduct them in the most skilful manner. Thi last object is one of very great importance in the existing state c theoretical agriculture.

Upon this subject I add only one or two other observa tions. By following out the above course of procedure, Scotlan as she had the first national agricultural society and the fir chair of agriculture, would take the lead likewise, and be th first to place a regular and complete course of agricultur instruction within the reach of the owners and holders of th land. She would confer a boon also upon the entire agricultur classes of the empire, not more by the systematic education sh would offer them, than by shewing how very easy a thing it is, afte all to provide such instruction *when parties are really intereste*

e attainment of it. The Scottish association may accom- this last object without any alteration or infringement of other plans and intentions. It would complete and fill up r their scheme for the improvement of Scottish agriculture, would reflect still greater honour upon those by whom it has originated and supported.

have thus considered, in some of its bearings, the ques- –What may now be done for Scottish agriculture? An iation instituted by practical men, and composed chiefly of and yet professing objects of so enlightened a kind, must garded as an important feature in the history of agricultural ress in the northern end of the island. I have considered uestion, therefore, in reference chiefly to what this associa- if rightly directed, may be able to effect.

t their officer, in his excursions, rally round him the farmers rious districts, let them accompany him in his tours, partake s inquiries and conversations, listen to his observations and sses, and the special excellences in the practical culture of everal counties will be more readily and generally diffused by almost any other method;—let him, in his oral addresses, d and illustrate the relations of science to agriculture, scat- ; here and there a little of that knowledge which, though ng, has not hitherto been applied to practice, and awaking, and there, a more ardent mind to a desire for more, and the of agricultural practice will rapidly approximate to that of ltural theory;—let him conduct in his laboratory such d analytical investigations as those I have alluded to, and ist that still lingers around so many of the most important ltural questions will gradually disappear;—let him suggest irect experiments in the field, and cautiously and skilfully s and interpret their results;—let him, by his less refined igations, defend the farmer against the quackeries and rations of the dealers in artificial manures;—let him in his pondence give advice in regard to the qualities of soils, of ones, and of other natural productions which are likely to use in the culture of the land;—let him follow up all by a ete annual course of lectures during the dead months of , and thus train up, year by year, a band of zealous and plished, yet cautious experimenters; and, *lastly*, let this form only one of a series delivered during the same months, ind of *central school of agriculture*;—let these things be with half the zeal, and persevered in with half the nination, which has brought the association to its present and it will be difficult to assign a limit to the improvement must follow.

AM, *3d June*, 1843.

AGRICULTURE AND POLITICAL ECONOMY.

By Joshua Trimmer, F.G.S., &c.

An opinion appears to be daily gaining ground among the agricultural classes, that they must not expect for their produce higher prices than those which they are now receiving; and that the policy of the Government, whatever party may be in power, will rather be to diminish than to increase the protection afforded by fiscal regulations. That section of the agricultural interest which holds these opinions are girding up their loins for the contest, and are looking to the expenditure of capital in the permanent improvement of the productive powers of the soil as the best means of enabling the British farmer to compete with the foreign corn-grower, at prices approximating to those of the Continent. The example of the improvements effected in West Norfolk by the late Lord Leicester, and of those which have raised the Lothians and the English border to so high a state of cultivation, have shewn that capital, judiciously expended, is capable of producing a large increase of rent to the landlord, which will ultimately compensate him for that reduction of the present money rents which the alteration in the value of corn and cattle renders necessary for the safety of the tenantry. Such employment of capital is, moreover, of the utmost importance in a national point of view, from the prospect which it holds out of increasing the supply of home-grown food, and of affording profitable employment for a portion, though but a small portion, of our rapidly-increasing population. In order, however, to effect the necessary improvement, a large amount of capital will be required; and the question naturally arises as to the quarter whence it is to be obtained. Neither the landlords nor the tenantry, as a body, possess it. It must be borrowed by the one or the other, on the security, in the case of the landlord, of the estate, as far as the English laws affecting landed property will permit—in the case of the tenant, on the security of his lease and personal credit. It has been proposed that the Government should advance the necessary funds—a measure the policy or impolicy of which it is needless to discuss, as it is very evident that the Government are not likely to entertain such a proposal. At the same time there is, in the hands of the monied interest, a vast amount of capital for which it is difficult to find employment, and for which the improvement of our own soil holds out the prospect of a more safe and profitable investment than those foreign mines, loans railways, and other bubble schemes, with which speculators are ever so ready to bleed our capitalists, when labouring under these periodical symptoms of determination of blood to the head, they

themselves being at the same time so ready to bare their arm to the lancet. It therefore becomes of the utmost importance to the landed interest that monied men should be inspired with confidence in the productive powers of the soil, and its capability of returning, with interest, capital expended in its improvement. There are, however, two causes which tend to deprive them of the confidence necessary to induce them to lend their money for such purposes, namely, the denunciations of writers on political economy against the impolicy of cultivating poor soils, and the outcry raised by a large section of the agricultural body as to the impossibility of successful competition on the part of the British farmer with the foreign corn-grower, without the aid of legislative protection. The fallacy of the objections of the political economists I shall endeavour to point out in this article.

Colonel Torrens, in an able pamphlet, the object of which is to advocate an extensive plan of colonization, for the purpose of employing our redundant population and surplus capital, and of opening new markets for our languid commerce and stagnant manufactures, warns us that increased cultivation of the soil of the United Kingdom will have the same effect in reducing rents as an extensive importation of foreign corn; and that the agricultural improvements now in progress will, in the first instance, deprive large masses of the rural population of employment. The following are his arguments :—

"Ricardo has demonstrated that agricultural improvements lower rents. As the subject is of great importance, I will present the demonstration in the words of its distinguished author. After shewing that the rent of land must fall as the wealth and population of a country decrease, he proceeds as follows :—'The same effects may, however, be produced when the wealth and population of a country are increased, if that increase is accompanied by such marked improvements in agriculture as shall have the effect of diminishing the necessity of cultivating the poorer lands, or expending the same amount of capital on the cultivation of the more fertile portion.

"'If a million of quarters be necessary for the support of a given population, and it be raised on lands of the qualities Nos. 1, 2, 3; and if an improvement be afterwards discovered, by which it can be raised on Nos. 1 and 2, without employing No. 3, it is evident that the immediate effect must be a fall of rent; for No. 2, instead of No. 3, will then be cultivated without paying any rent, and the rent of No. 1, instead of being the difference between the produce of No. 3 and No. 1, will be the difference only between No. 2 and No. 1. With the same population, and no more, there can be no demand for any additional quantity of corn; the capital and labour employed on No. 3 will be devoted to the production of

other commodities desirable to the community, and can have n effect in raising rents, unless the raw material from which the are made cannot be obtained without employing capital le advantageously on the land, in which case No. 3 must again b cultivated. It is undoubtedly true that the fall in the relati price of raw produce, in consequence of less labour being bestowe in its production, would naturally lead to increased accumulation for the profits of stock would be greatly augmented. This acc mulation would lead to an increased demand for labour, to high wages, to an increased population, to a further demand for ra produce, and to an increased cultivation. *A considerable peri would, however, have elapsed, attended with a positive diminuti of rent.*'

"This reasoning," continues Colonel Torrens, "as it appea to me, is quite perfect. The rent of the first quality of land is t difference between the return yielded to a given amount of capit by the first and the last qualities of soil under cultivation. It self-evident that the difference between No. 1 and No. 2 is le than that between No. 1 and No. 3, and it is equally self-evide that if No. 3 be thrown out of cultivation, either by increas imports or by improvements in agriculture, the rent of No. 1 w be reduced."

It appears, however, that there is a difference of opinion amo the political economists on the subject of Mr Ricardo's theory rent. Mr Malthus, we are told, attempted to refute it; and t author of Six Letters to Sir Robert Peel, signed, "A Political E nomist," undertakes to do the same, declaring "that this theo has done more mischief to this country, in misdirecting the cou of its industrious classes, and shaking its political institutions their foundations, than the efforts of the most powerful declar enemies could have accomplished. Upon this theory our wh system of restrictions has long hung; upon it foreigners ha founded their exclusive policy, from which we and they have lo been sufferers."

Of all classes the agricultural is the least likely to be guid in its industrial operations by Ricardo's theory of rent. Farm and country gentlemen are plain men, who know little about t science of political economy, except that they have heard it to a dangerous innovation, and that its professors are dea enemies to the landed interests; and, in truth, it is not surpr ing that they should look with suspicion on a race of men *et dona ferentes*—who talk so much, and with so much composu about throwing poor soils out of cultivation. Some landlor and tenants have found, by experience, that the application capital to poor soils increases the value of them, and pays go interest for the outlay; and they want to borrow money to e

tend their improvements. On the other hand, the monied interest, who, from the nature of their occupations, know little of rural affairs, and cannot distinguish soil No. 1 from soil No. 3, are not likely, though overflowing with capital, to be convinced that they can lend with safety for this purpose, while one school of political economy is scaring them with the ghost of Mr Ricardo's theory of rent, and one section of the landed interest sit wringing their hands in despair at the late change of policy as regards protection to agriculture, and re-echo the cry about the poor soils going out of cultivation. Neither is the desponding portion of the agricultural body likely to derive much comfort from the anti-Ricardo school of economists, who bid them be of good cheer, for the path of safety lies before them in abandoning the growth of wheat, and trusting for the payment of their rents to the sale of game, pine-apples, and forced flowers.

Rent, we should define to be that portion of the produce which remains after deducting the cost of cultivation and a fair remuneration to the tenant for his time, skill, and capital. To this definition every farmer and land-valuer will assent, unless they prefer that which states rent to be the sum paid for the use of the land. If venturing to offer an opinion on so abstruse a subject as the origin of rent, it would be delivered in the words of a celebrated country gentleman, immortalized in the *Spectator*, that there is a great deal to be said on both sides; or in the words of a worthy, living member of the quorum, who declared that he could not understand one page of an act of Parliament till he read the next. On the one hand, the history of British agriculture, during the last century, presents facts so opposed to the Ricardo theory as to make it evident either that the theory is unsound, or that there are disturbing elements present which render it inapplicable to our case.

The theory may be true respecting the system of arable culture which prevailed from the days of Triptolemus to those of Lord Leicester and the Culleys, but false with respect to the modern system. The ancient arable culture consisted in growing a succession of corn crops, till the land would scarcely return the seed, and then allowing it to recover its exhausted fertility by a long rest under natural pasture, or by a bare fallow. Its object was to reduce soil No. 1 to the condition of No. 3, or any lower point in the scale of fertility, dependant on the number of corn crops extracted from it. The modern system raises No. 4 to the productiveness of No. 1, by combining the growth of corn with the raising of those products which were formerly obtained only from pasture land. From the portion of the farm applied to the growth of grain, it obtains, on the inferior soils, as much corn as the old system produced on an equal surface of the best; and it

obtains, from that portion devoted to turnips and artificial grasses, as much beef, mutton, and wool, as an equal area of the best land would yield under permanent pasture. To this system of husbandry the inferior soils are better adapted than the best; because more dry and friable, and, therefore, better suited to the turnip husbandry. The cultivation of wheat upon the rye soils and rabbit warrens of West Norfolk, instead of raising the rent of the best old wheat soils, as it ought, in accordance with the Ricardo theory, has well nigh been the means of driving them out of cultivation. Nos. 1 and 2 of Mr Ricardo, which have been under tillage since the doomsday survey or even the Roman invasion, were unable, in 1836, to compete with No. 3, the better description of barley soils, or even the sands of West Norfolk. This was proved before the Agricultural Committee of that period. The result of that inquiry shewed that the low price of wheat then prevailing arose from abundant harvests and the increased produce of the light soils. The heavy lands—the proper wheat soils—were suffering the most. There was reduction of rent, and land going out of cultivation—for no witness could prove that any had actually been abandoned; but they were at the wrong end of the scale for the Ricardo theory. The rents of Nos. 1 and 2 were reduced, not because Nos. 3 and 4 were withdrawn from tillage, but because they were in a high state of cultivation.

On the other hand, the Ricardo theory may be false—the rent of land may arise, not from the extension of cultivation to the inferior soils, but from the demand for land, occasioned by an increase of population, for buildings, parks, gardens, and railway stations, without reference to its capability of producing corn or cattle. But what is gained by subverting the theory, if we can found upon its ruins no more practical structure than that raised by the author of the Six Letters to Sir Robert Peel, that we ought "to convert the whole land into a continued park and garden, so as to render dairy produce, meat, fish, game, vegetables, and fruit, as abundant as pearl barley and oatmeal." Between the two schools of political economy who undertake to guide the poor farmers in their industrial operations, it is hard to say which would lead them most astray. But, lest it should be said that we mistate the author's meaning, we will give two more extracts from the six letters.

"The expense of cultivating cereals is diminished by alternating with green and artificial food crops, for two reasons—first, because upon the dung which the farmer can dispose of depends the amount of produce which he can extract from the soil. The extent of green crops, which allow the land to repose and dung to accumulate depends on the density and prosperity of the population.

In poor and thinly-peopled tracts, for instance in Mecklenburg, Pomerania, Poland, and Hungary, there is little inducement to keep stock, except for the sale of wool, hides, and tallow. In South America, the wild cattle are slaughtered for their hides, and the carcase is abandoned to the beasts and birds of prey. In such countries the farmer allows his land to repose under fallow, and loses the produce that might be extracted from it every third year. The improvement in prices which allows him to add stock-husbandry to tillage, not only saves him from this loss, but adds a more valuable crop to the rest. Dairy produce, where there is a sale for it, and grazing, where meat is in demand, pay better than corn. The distinction must, of course, be drawn where rent is considered between the landlord's demand for the use of the land, and the sum which the tenant may have invested in improvements. If improvements are injudicious—and all enormous expenditures with a view to extort cereals from poor soils are clearly so—the farmer does not benefit by abandoning corn and taking up stock-husbandry. In this manner, in consequence of the illusory advantages held out to corn-growers, by our high duties, many have invested such great sums in under-draining and other improvements, that they have preferred allowing a large portion of our dairy husbandry to be transferred to Holland, Holstein, and Friesland, rather than cease the cultivation of wheat. The farm-yard husbandry, or the production of eggs, fowls, &c., has been allowed to go over to France, and apples and other fruits are sent from the Continent, and even from America.

"Now the abandoning of the present artificial inducement to grow corn would bring back to these islands a large portion of this kind of cultivation which has thus abandoned them. The parties who have invested money injudiciously would lose by the change; but rents (strictly speaking) would rise, and agriculture, on the whole, would prosper. Farms would probably be changed in size, and there would be more comfort and enjoyment in all classes. Corn, instead of being the remunerating crop, would be looked upon as a dangerous investment, while, at the same time, the abundance of meat, poultry, dairy produce, and vegetables, would gradually lessen our dependance on the foreign grower to the minimum of farinaceous food necessary to the support of animal life. This is what I should call a healthy state of agriculture." And again he says—"From what has been shewn to be the operation of an accumulation of capital and population upon land, there are clearly in every country two sets of cultivators of the soil. Those who look for profit from supplying the articles of first necessity, consisting of farinaceous and animal food, as well as raw materials for manufactures, are, in large countries, the most numerous. It was, therefore, not only an unnatural, but

evidently a most erroneous view of this country, to suppose t
rent could only be derived from this use of the land. I trust t
I have adduced convincing evidence on this head, and have sh
that the real prosperity of the country, and, consequently,
advantage of the landowner, lies in the continual diminutio
this species of cultivation, and in the extension of more remu
rating modes of using the land. The extension of building,
tory, road, and canal demand, carrying in its train garden, t
is, flower, fruit, and vegetable cultivation, dairy farming,
stock-husbandry, is clearly the legitimate mode of drawing
highest possible value out of the land, and forms an ascen
scale in which it is not possible to err."

We have seen that, by combining stock-husbandry with
age, the increase of population and the growth of commerce
manufactures, having produced a demand for the produce of
soil, the inferior lands have been rendered of more value t
some of those which were considered the best when the gro
of corn was the sole object of arable culture. Lord Leice
effected one revolution, Mr Smith of Deanston is now effect
another; and is about to raise the value of the heavy soils,
rendering them applicable to the growth of turnips as well a
wheat. And again the political economists warn us that by
doing we shall lower rents and throw masses of the agricult
population out of employment.

"It is abundantly evident," says Colonel Torrens, "that, co
the contemplated agricultural improvements be realized,
wealth of the country would be proportionably increased; bu
is equally evident that, if realized, their *first effect* would b
throw a wide extent of land out of cultivation, and a large
tion of the rural population out of employment. In aver
years, the United Kingdom already yields a supply of c
nearly sufficient for the consumption of its inhabitants. T
being the case, the necessary consequence, not of quadrupl
or tripling, or doubling that supply, but of increasing it by
fourth, would be *to supersede the cultivation of one-fourth of*
kingdom. As regards the throwing out of inferior soils and of
labour employed upon them, the effects of creating a sudden
crease in the supply of domestic produce, would be identical w
that of importing an equally increased supply of foreign prod
In either case, the first result would be a period of transit
and revulsion, during which a portion of the rural populat
would be reduced to destitution.

"Again, the establishment, throughout the United Kingdom
a system equal to that of the Lothians, would, in the first
stance, diminish the demand for labour, not merely in the infe
districts thrown out of tillage, but also upon the superior la

to which the improved system would be applied. The system of agricultural improvement which has been adopted with so much success in the Lothians, consists of economy of management, shewn in the division of employment, confining the attention of the farmer to as few points as possible—in a due rotation of crops, so as to have no land lying idle or unproductive—and in *the use of machines and horses instead of manual labour wherever circumstances admit of it.*"

Again he says—

"The consequences of introducing the Scotch system of farming into Ireland would be terrific. In the Lothians, the farms range from 300 to 500 acres and upwards, and the general complement of labour for 100 acres is two pair of horses, two ploughmen, and one labourer, giving a population of three families for 100 acres. Thoughout a great part of Ireland, the holdings are from ten acres to five acres and less, giving a labouring population of upwards of ten families for 100 acres. Introduce the Scotch system of economical farming, and more than one-half of the rural population will be deprived of their accustomed means of existence. The Celtic hordes will migrate and swarm into Britain. Wheat-fed, decent-clad, cottage-lodged England, will disappear under the avalanche of potato and weed fed, half-naked, mud-lodged Ireland."

The danger, however, of any very sudden improvement in agriculture is little to be apprehended. Farmers do nothing suddenly, unless it be to drive their sheep and cattle to market under the effects of panic, in consequence of the new tariff. Their *vis inertiæ* is a sufficient guarantee against any reduction of rents from this cause. The same remark applies to the majority of the landlords. These impediments removed, there remains that of the want of capital in the hands of the agricultural body, and the difficulties which our law of entails, and the repugnance of many landlords to grant leases, throw in the way of its being borrowed by the owners and cultivators of the soil; while the outcry of many of the agriculturists for protection, and the denunciations of the political economists against agricultural improvements, aggravate these impediments; so that the great difficulty will be to carry the improvements into effect fast enough to meet the wants of an increasing population. It is well known that when Lord Leicester had proved that wheat could be grown with profit on the Holkham soil, it was nine years before he could induce any farmer to follow his example. During that period the population would now have been increased by nearly two millions. Reasoning from the past, we may expect that a similar increase will take place during the next ten years, and these two millions will require an additional annual

supply of at least 1,500,000 quarters of wheat. Dismissing, therefore, from our minds the abstract doctrines of political eco- nomy, let us descend to the consideration of facts. Whitfield farm, which has been so much improved by Lord Ducie, unde the management of Mr Morton, will furnish us with an excellen practical illustration of the effects which agricultural improve- ments have in reducing or increasing the value of land, in throwin masses of the rural population out of work, or of providing fo them increased employment. This farm had been held by th same tenant under a yearly tenure for twenty years; the capita employed by him in its cultivation, as a dairy farm, with a smal portion of arable land, was not more than £700. The annu expenses of cultivation were about £170, and the returns, wit wheat at 56s. the quarter, and cheese at 50s. the cwt., wer £463; the rent was £200, and the tithe and parochial taxes £65 leaving to the tenant little more than £28 for his time, skill, an capital. The number of persons employed upon it was thre men, two women, and one boy. In 1839, this farm was taken i hand to be managed by Mr Morton, junior, as an exampl farm, for the purpose of introducing an improved system cultivation among the neighbouring farmers. The work improvement commenced with felling the whole of the timbe with which the farm was overgrown, and which netted £3,10 after deducting the expenses of the sale and the sum £170 expended in forming a road by which to haul it off. Th old straggling fences have been grubbed, and the farm has bee laid out in nine and ten acre fields; the land has been unde drained and subsoiled on the Deanston plan, and limed. Ne buildings, with thrashing mill and other machinery, have bee erected, at a cost of £2,978. The following are the items of expens incurred by the landlord in permanent improvements, for whic interest is to be paid by the tenant, or the representative of th tenant, at the rate of five per cent. in addition to the old rent.

Landlord's Expenditure in Permanent Improvements.

Roads and Bridges,	£451	3	4
Grubbing up hedges and roots,	576	15	7
Drainage,	2,066	6	11
Levelling, and permanent improvements not referrible either to roads, drainage, or grubbing,	837	19	8
Fences and walling,	110	15	11
Subsoil ploughing,	181	2	10
Liming,	625	17	6
Buildings,	2,978	9	8
	£7,828	11	3

Here, then we have an example of an "enormous expenditure

which would shock every political economist, whether of the Ricardo or anti-Ricardo school. Their grand panacea is the withdrawing of the inferior soils from tillage, and the application of them to pasture and dairy husbandry. In the case of Whitfield farm, a sum amounting to nearly £8,000—by the time the subsoiling and liming, not yet quite finished, are completed, it will be quite that—has been expended in reversing their favourite process, and converting pasture, almost in a state of nature, into arable land.

Let us see what the results have been to the landlord, the tenant, the labourer, and the community at large. The first question is, whether the landlord is likely to be remunerated for this large outlay. To answer this question we must know what the farm, in its improved state, would be worth to an incoming tenant. This has been ascertained for us.

In 1840, Whitfield farm was valued for the poor-rate, the gross value being estimated at £200, and its assessable value at £160. In 1843 it was again valued, by the same surveyor, for the poor-rate and county-rate, by order of the county committee, at a gross value of £564, its assessable value being £504. The difference between £160 and £504 is £344, or £4 : 6s. per cent. on the outlay of £8,000.

But, by an understanding with Lord Ducie, it was arranged that no rent should be charged for the first two years, in consideration of the injury done to the land in clearing off the timber; and that, after that period, the old rent should be paid, together with five per cent. on all moneys expended in permanent improvements. At this rate, the future rent will be as follows:—

Old rent paid by preceding tenant, . .	£200	0	0
Rent of land added to Whitfield, . .	30	0	0
Five per cent. on £8,000, . . .	400	0	0
	£630	0	0

And the next question will, therefore, be, whether the tenant will be able to pay this increased rent. Mr Morton's original estimate of the outlay necessary for the permanent improvement of Whitfield farm was £3,500. The cost of the actual operations has, as appears above, been more than double this estimate. But if the expenditure has exceeded the estimate, the returns have exceeded it in a still greater degree. The estimated produce of wheat, on that portion of the land which was devoted to arable culture under the management of the late tenant, was no more than 1½ quarter per acre. In 1841, ten acres of the old arable land yielded, under the new system, 5 quarters 6 bushels per acre. In 1842, the wheat crop of forty acres had been thrashed, and averaged, over the ten-acre fields on which it

was grown, 5 quarters 1 bushel and 5 quarters 6 bushels re tively; and some of it, Mr Morton says, would have been productive, but for the great burthen of straw, equal to sheaves per acre, 30 inches in circumference and 4 feet Carrots, Swedes, mangel wurzel, and turnips, have aver about 23 tons of clean roots per acre, which, owing to imperfectly reduced state of the soil, must, Mr Morton be much below the future averages. From a balance s made up to Lady-day 1842, it appears that the farı capital, employed in the cultivation of the farm, amou to £4,069, or more than three and a-half times that empl by the preceding tenant. Of this amount, £991 is dori capital, or money sunk in fallowing and other operations c lated to place the farm in that state of cultivation in which intended to be kept. It also appears that, at the end of third year, the returns from the farm had been sufficient tc the landlord five per cent. on the moneys expended up to time in permanent improvements; to allow the farmer five cent. on his dormant capital, in order to return it in fifteen y to make good all losses sustained by live and dead stock, su to casualties and wear and tear; and that there was, besid clear profit, on the three years' operations, of £161 : 16 besides interest, at the rate of ten per cent. on all the ca invested by the farmer in the cultivation of the land. It app therefore, that this large outlay has so far been beneficial to landlord and tenant, though the future profits will, of co be affected by the fall of twenty per cent. which has taken p during the past year, on agricultural produce. Improvem effected with labour, paid for in high-priced produce, will to be returned in low-priced produce. When, however, p shall have settled to their level, and wages shall have adju themselves to the new scale of prices, similar improvements become as profitable as before; this is a strong argumen favour of a speedy and permanent settlement of the corn-law q tion; for improvements must proceed but languidly, and ca be so profitable, while we remain in a transition state, as otherwise would be. Among the items composing the am expended in permanent improvements, that of which the policy pears to be the most questionable is the large sum laid out on bu ing for so small a farm—the interest on which forms a consi able proportion of the new rent. The report states that the p cipal buildings are sufficient for a farm of nearly double the s and, as it also states that an expenditure of £228 for machi was incurred in preliminary experiments, which would be u ;essary in another case, we may conclude that the sum exper it Whitfield would be sufficient for a farm of 500 acres.

old rent, and five per cent. on the outlay on two such farms, would amount to £1260; whereas, if 250 acres were added to this farm, with the present buildings, the old rent and five per cent. on the outlay would amount only to £1111, which would be a saving of rent to the tenant of £149 a-year. The propriety of the large outlay for buildings, therefore, depends, in a great measure, upon the question whether there is an opportunity of adding, hereafter, to this farm, another of the same size, conveniently situated with respect to these buildings.

The expenditure at Whitfield having been profitable to the landlord and the tenant, we have next to inquire, What have been its effects upon the agricultural labourer? On this point it is obvious that the outlay of so large a sum, the greater part of which has been expended in manual labour, must have been productive of a great increase of temporary employment while the improvements were in progress. It has, however, also been productive of an increase of permanent employment; for the number of persons employed on Whitfield farm, under the former tenant, were, as we have seen, three men, two women, and one boy—in all, six persons. Mr Morton's estimate of the number of hands to whom permanent employment will be afforded, in the ordinary operations of cultivation, under the new system, is seven men, two boys, and two women, as yearly servants, besides a sum expended in piece-work, which may be considered equal to the employment of four men, three women, and three boys, throughout the year. Constant employment will thus be furnished to eight men, three women, and three boys, or fourteen hands in all, more than under the old system of management, which is that recommended by the political economists for land of this description. They will, however, perhaps tell us that, though the money thus expended in improvement has, in this instance, caused an increase of rent to the landlord, an increase of profit to the tenant, and an increase of employment to the agricultural labourer, yet, if the example were generally followed, it would be productive of such an increase of produce as would have the same effects as the extensive importation of foreign corn, in lowering rents, causing the tillage of poor soils to be abandoned, and throwing large masses of the rural population out of work. Let us therefore endeavour to estimate the amount of capital which the improvement of one million of acres, similarly circumstanced to Whitfield farm, would absorb beyond the amount already employed on it; the additional quantity of wheat that would be obtained from this quantity of land; the additional number of hands to which its improvement would afford temporary occupation, and to which its improved cultivation would furnish permanent employment.

In estimating the amount of capital to be invested by tl landlord, in improving the productive powers of the land alreac in his hands instead of in the purchase of additional acres, v will not take the expenditure at so high a rate as on Whitfie farm. A very large proportion of that expenditure is fc buildings, roads, the grubbing of hedges, fencing, and levellin The liming, draining, and subsoil ploughing, do not amount £12 : 10s. per acre. This expenditure is all that, in most case would be required to produce the same results which have bee produced at Whitfield; and the operation of draining has, the present case, been rendered more expensive than usual, t the roots of the timber with which the farm was encumbere In general, the expense of draining and subsoil ploughing vari from £6 to £10 an acre. Mr Morton's original estimat of £3,500 as the sum to be expended by the landlord in th permanent improvement of 250 acres, may therefore be co sidered as more generally applicable than the actual expenditu which has taken place on Whitfield farm. We will call th £4,000. At this rate, 1,000,000 acres would absorb £16,000,00 in permanent improvements; and the tenants would require capital of full £13,000,000 beyond that already possessed t them, making altogether £29,000,000. This, applied durin ten years, would be at the rate of £2,900,000 annually. Tl increased produce of wheat from these 1,000,000 acres, aft deducting seed, and taking the original yield at 1½ quarter, ar the improved yield as high as 4½ quarters per acre, which nearly a quarter more than Mr Morton's estimate, though le than the actual yield of Whitfield farm, will be as follows:—

Wheat, 50 acres, at 36 bushels . .		1800 bushels.		
Deduct seed		150		
		1650		
Former produce, 14 acres, at 12 bushels,	168			
Deduct seed	42			
		126	Qrs.	B.
		1524 =	190	4

This being the increased produce of 250 acres, that of 1,000,0 acres will be 762,000 quarters.

Of the sum expended by the landlord and the tenant, in perm nent improvements, it may be safely calculated that £1,000,0 will be annually paid for labour; which, at 9s. a-week, will pr duce additional temporary work for upwards of 85,000 me during half the year—for draining can only be done in t vinter; and the ordinary cultivation will occasion an increas lemand for the labour of 56,000 individuals during the wh

year. The two will be equal to the constant employment for the ten years of 98,500 men, women, and boys. Their consumption, at the rate of six bushels a-year each, will amount to 73,875 quarters; and as the increased produce will be 762,000 quarters, there will remain a surplus of 688,125 quarters for the consumption of the non-agricultural portion of the population. During the ten years the population will have been increased by 2,000,000, of which increase there will be—

98,500	employed in agriculture.
1,901,500	non-agricultural.
2,000,000	

The non-agricultural population will require an annual increased supply of 1,426,125 quarters, whereas the surplus of home growth, above the wants of those employed in raising it, will not amount to half this quantity. It is evident, therefore, that we may safely invest the sum of £6,000,000 annually in the permanent improvement and improved cultivation of the soil, without doing more than to keep pace with the demands of an increased population, provided our population shall continue to increase at its present rate, and provided commerce and manufactures shall be sufficiently flourishing to furnish them with the means of subsistence. This increased supply of home growth will not diminish one bushel of that which we at present import from foreign countries. On the contrary, there is every probability that importation will increase, even in the face of this enlarged home supply. A century ago, a large portion of the agricultural population lived upon rye bread who are now consumers of wheat. Should the Irish lose their relish for potatoes, as they have lost their taste for whisky, or should the grain, "which surly Sam called horse's food," fall into disrepute in Scotland and the north of England, there would be a greatly increased demand for wheat. These changes are said to be now in progress, and would probably be greatly accelerated should the price of wheat continue permanently low; and as the climate of a large portion of Ireland and of Scotland is better adapted to the growth of other grain than wheat, the barley and oats produced there would be applied, like turnips and clover, to the fattening of cattle; and thus, instead of diminishing, would maintain if not increase the fertility of the soil. The increased demand for wheat, arising from such a change in the habits of a portion of the population, would be probably greater than our wheat-growing districts could meet, and must be supplied from abroad.

The difficulties before alluded to, as likely to be encountered by landlords and farmers in obtaining the capital necessary to

carry these improvements into effect will be a check extending so rapidly as to cause a reduction of rents, throw masses of the rural population out of employme we have shewn that, in the first instance, they will have trary effect. When the progress of improvement sha there will, of course, be a portion of labour withdrawn land which will have to seek employment in some other tion. The numbers calculated on in the preceding esti permanently employed in cultivation, is larger than the proportion as stated by Colonel Torrens, which does not grieve, shepherd, and cowman; but even that proportion the number employed on Whitfield farm in its unimprov

Improvements in agriculture do not diminish labo transfer it to profitable from unprofitable employment. instance, we plough land with two horses which, from ha for no other reason, had previously been ploughed with save the keep of one horse and a driver. The ploughbo advantageously employed in pulling and slicing the turnip sheep, which will add at least one-fourth to the value of t and the keep of the horse saved will be sufficient to d subsoil from three to five acres annually. If the thras and the drill-machine supersede the barn-man and the s hoeing of drilled corn and turnips, in the spring and with the making of compost-heaps in the winter, and the of ditches, which were before unscoured, furnish employ them. There is one capital improvement which has add to the value of land, without throwing even a herdbo work, and that consists in the fattening propensities a maturity of the improved breeds of live stock.

In comparing the Lothian proportion of labour with agricultural families to the hundred acres in Ireland, remember that the whole of those ten families are no agricultural. Ireland, strange as it may sound, is a gre facturing country, but her operatives are so blended agricultural population that it is impossible to define t of either. The farmer of Ulster is but a weaver raising food and raw material. His rent is paid, not by the by the web. The turf-bogs are the collieries of Ireland. goodness of Providence," said an Irishman, in travelling Staffordshire, "these poor people cannot get turf, so t s." Every farmer in Ireland is his own pitman, an several months of the summer in these coal-fields, win turf. He is also his own lime burner; on the coast he i fisherman; till lately, he was his own distiller; he make candles—his own soap, when he uses it—his own stockin wears them his own blankets, and the grey frieze of

and, besides these, he carries on that extensive manufacture of hay ropes, to be used for a variety of purposes, to which nothing but Irish ingenuity could ever have applied them. They form the hat-band that adorns his *caubeen* and the harness of his car; stretched across a gap, they aid the barrier of loose stones which serve as a substitute for a gate; formed into *spansels*, they confine the legs of his live stock, and act as substitutes for fences; and they constitute that remarkable ornament for the human leg which the Irish call *sugawns*, and the English hay-band boots. Besides the numbers employed in these extensive domestic manufactures, there is that large portion of the population which in Ireland is employed in doing nothing, and therefore very prone to mischief, and which would be much better employed in felling the back-woods of Canada. Deduct these from the ten families to the hundred acres, and it is questionable whether the number of the strictly agricultural labourers exceeds that of the Lothians.

There are two modifications of the convertible system of husbandry, or that which combines stock-farming with tillage—the Flemish and the Scotch. The former is the most ancient. Norfolk derived the culture of green crops from Flanders. It passed thence into Scotland, where the turnip culture received its last great improvement. The two systems are adapted to different states of society. The Scotch is best suited to that social condition where the division of labour is carried to the greatest perfection, and the manufacturing and agricultural classes are totally distinct. It is the system of large farms, and has recourse as much as possible to machinery as a substitute for manual labour. Its live stock may be either sheep or cattle. Combined with the kind system of hired householders, paid their wages in kind, it perhaps produces more real comfort among the agricultural labourers, though it employs fewer of them, than the more popular system of small farms. In England we have the large farms less perfectly cultivated than in Scotland; and the labourers, being paid in money instead of in kind, are great sufferers during fluctuations of prices.

The Flemish system, on the other hand, is best suited to that social condition in which there is a dense population and no division of labour—no employment for them except upon the land. It is the system of small farms, and uses the spade as well as the plough. It is better adapted to the feeding of cattle and dairy husbandry than to the keeping of sheep. It is obviously the system best suited to the actual condition of Ireland. Those who are endeavouring to improve the agriculture of that country very wisely give it the preference, and are introducing it with success. What effect it will have, with its turnips substituted in

part for potatoes, its stall-fed cattle, and its liquid-manure tanks in reducing Irish rents, and throwing masses of agricultural labourers out of employment—how Irish rents originated, whethei in the injudicious application of capital in forcing the growth of cereals on inferior soils, or in the demand for *con acres* and potato grounds, occasioned by the accumulation of population and capital upon the land, or by the accumulation of the population without the capital—these are questions which must be left to the political economists to decide. Whenever the time shall arrive that our commerce and manufactures shall begin to decline, it will be necessary, in order to employ the population now engaged in them, to substitute in Great Britain the Flemish system for that of large farms. Our commerce and manufactures, and our colonial empire, have been the means by which Providence enabled us to pass in safety and triumph through one tremendous conflict. They may yet be destined to carry us through another. When they, and with them our naval supremacy, shall have fulfilled their appointed end, they will vanish like empires as mighty, whose place is now nowhere to be found Whenever the time shall arrive,

> "When, more unsteady than the southern gale,
> Commerce on other seas displays her sail;
> And nought remains of all that riches gave,
> But towns unmann'd and lords without a slave:"

then the system of small farms, spade husbandry, and domesti manufactures, must be resorted to as the means of supportin on the land those whom foreign commerce called into existenc but can no longer employ. But, while our present position amon nations is to be maintained, it can only be by means of ships colonies, and commerce. To the maintenance of these a larg non-agricultural population is essential, and, as long as we re main under that social condition, the Scotch system of agricu ture is best adapted to our wants, as affording the largest surplu supply of food beyond the consumption of those employed i raising it, while it requires, on its part, a large body of noı agricultural consumers. But foreign nations are rivalling us i manufacturing skill and in the application of machiner which, till lately, gave such superior efficacy to British manufa turing labour. At the same time, they are endeavourin .o counteract that degree of superiority which we still retaiı ıv adopting the restrictive policy of which we set the exan j.. and which we have too tardily abandoned. In order t hes.. heir infant, and, in many cases, sickly manufacture ıc mposing heavy duties on ours. These causes ar orcin ... money wages of our operatives and dim ..shin h ... consuming the productions of the soi

They render it necessary that the money-prices of food in this country should, at least, approximate those of the Continent. This state of things will render the manufacturing and commercial classes daily more and more impatient of attempts to give an artificial value to the products of the soil by legislative enactments; but the agricultural body are entitled to expect that the departure from the restrictive system, which has been so long maintained, shall be so managed as to inflict as little derangement as possible on the numerous contracts connected with the land which have been entered into on the faith of that system. It may be so managed as to have the effect of modifying many of those hostile tariffs, which are as injurious to those who level them against us as they are to us. That approximation of the price of food here to the prices of the Continent, which is necessary for the wellbeing of our manufactures, will probably be effected, as our restrictions are removed, by an advance on the Continent as well as by a depression here. To whatever extent the depression may take place, it will require, in the first instance, for the safety of the tenants, a reduction in the money-value of rent. This will be brought about in the fairest manner, both for landlord and tenant, by adopting the system of corn-rents. Improvements in agriculture, which will give an increased produce raised at diminished cost, accompanied by commercial and manufacturing prosperity, will produce, before long, a real advance of rent, which will ultimately compensate the landlord for the reduction which he must now make; and though the whole Continent of Europe and the United States of America should persist in excluding our manufactures from their markets, and though our altered relations with China should have no effect—as they probably will have no permanent effect—in giving activity to our languid commerce, we have in our own hands the power of opening new markets for our manufactures by means of emigration. Injudicious stimulants applied by the Government to the clearing and cultivation of the waste lands of our colonies, and the sudden removal of a large portion of our population, would, probably, be attended with effects as injurious as any sudden stimulus applied from the same quarter to the improvement of our own soil. At all events, our statesmen may well hesitate about commencing a national system of colonization on the gigantic plan proposed by Colonel Torrens. But a large stream of voluntary emigration has long been flowing from this country into the United States, though the derangement of the monetary system of that country has, for the present, checked it. This, by the expenditure of a moderate annual sum, might be diverted into our own colonies, where there are no hostile tariffs, and where it will be our own fault if any shall ever exist. It is, therefore, to be wished that the Government could be induced to make the experiment of a

national system of colonization on a moderate scale, which, if i did not produce all the benefits contemplated, would, at any rat do no harm, and which, if it proved beneficial, might easily b extended. There is in this country abundance of surplus capit both for the improvement of our own soil and the reclaiming c the waste lands of the colonies. The more emigrants the greate demand will there be for our manufactures, as the Custom-Hous returns of exports to the colonies incontestibly prove; and th greater the demand for our manufactures, the greater will b the demand for the products of the soil, and the larger the nun ber of our population that can be employed in its cultivation.

The cultivators of the science of political economy have hithe to been more connected with commerce than with agricultur From this cause, and from their want of acquaintance with agr cultural subjects, has arisen their exclusive preference for man factures, and their disposition to discourage, as unprofitable, th application of capital to the improvement of the soil; while th clamours of the agricultural body for protection have given, must be confessed, too much countenance to the opinion. Ever owner and cultivator of the soil will do well to read the pan phlets from which extracts have been given, for proofs of th effects which commerce and manufactures have in increasing th value of land, and for arguments in favour of emigration as th means of promoting manufacturing, and, through manufacturin agricultural prosperity; but they need not be deterred, by an thing which they may meet with in them respecting the origin rent and the impolicy of cultivating inferior soils, from applyi all the resources at their command to the improvement of t productive powers of the land, as the best means of diminishi the future annual cost of cultivation, and of compensating, by i creased produce, raised at a cheaper rate, for its diminish price. Neither let them encourage among other classes t belief that improvements in agriculture involve the necessity f the maintenance of prices at an artificial level by fiscal regul tions; or that the British cultivator is less able than the Briti manufacturer to compete with foreign rivals. And if the moni interest, between the arguments of the political economists a he querulous complaints of a portion of the agricultural bod re led to doubt the powers of the soil to return with inter he capital expended in its improvement, let them bear in mi ne case of Holkham, one only of many examples which mig adduced. The rental of that estate, when the late Lord L ster succeeded to it in 1778, was only £2,200; before his dea t had been increased by his improvements to more than t imes that amount, and the annual sale of the thinnings of t lantations exceeded the entire rental at the time the work improvement commenced.

THE FARMERS' NOTE-BOOK.—NO. I.

A Calculation shewing why Agriculture should be protected. By W. Keer Brown, Esq., Dover.—The statement as to the quantity of land in England, cultivated and uncultivated, is extracted from an old survey. The estimated rental is derived from a recent poor-rate return, which gives the value at about £30,000,000 annually, a small fraction under twenty shillings the acre. The amount of population is from the census of 1831, as no *classification* of the population of 1841 has yet been published. The writer's calculation rests, of course, upon the accuracy of these public records—they are his arithmetical charts. If they err, the inferences he has drawn from them must proportionably vary as regards figures.

		Acres.
Quantity of land in England cultivated,	. . . .	25,632,000
The bulk of this is presumed to have been since enclosed,	Uncultivated waste capable of improvement,	3,454,000
Unprofitable,	. . . .	3,256,400
		32,342,400

The present cultivated or rated land in England is taken at the mean calculation of 30,000,000 acres. It has been estimated higher. But if the former survey of acreable surface approximates to the true quantity, 30,000,000 acres may be viewed as in cultivation in England; rather tending to the *plus* than to the *minus:* but, in all calculations of this nature, fractional parts must be allowed for.

The census of 1831 gave the population of the forty counties in England, at 2,744,695 families—13,100,000 individuals, or four persons, three-quarters, and a fraction to each family. The agricultural population of England was given at 760,550 families, which, at four persons and three-quarters to a family, is 3,712,402 persons; and dividing the 30,000,000 acres of cultivated land in England into portions of 100 acres each, there art 300,000 portions. This, at twelve persons of population on each portion, makes 3,600,000 persons, leaving a fraction of 112,402 persons. Thus, each hundred acres carry about, on the average of England, $2\frac{5}{8}$ families of $4\frac{3}{4}$ persons in England to each family.

The acreable surface of the cultivated or rated land in England being 30,000,000 acres, and the population 13,100,000, gives two acres and a quarter, and the seventh part of an acre to each individual for support on agricultural produce, in England—deducting maintenance of horses.

Calculating the produce of the soil of England, *on the whole average of land*, a rate of L.4 the acre, or four rentals, the annual agricultural produce, *exclus* timber, bark, poultry, fruit, and vegetables, is	L.120,000,000
The agricultural population, or producers, consume at two acres and a quarter each, *deducting* horse maintenance, at L.4 the acre, L.9, on 3,712,402 persons annually,	L.33,411,618
The other population, or consumers, consume L.9 each, (2¼ acres,) on 9,387,588 annually, (deducting horse consumption,)	84,387,592
	L.117,900,000
Fractional part,	2,100,000
	L.120,000,000
2-7ths of L.120,000,000 producers, ...	L.34,285,714
5-7ths of L.120,000,000 consumers, ...	85,714,285 1
	L.120,000,000,
According to the population returns, it has been seen that 2-7ths of the popul in England are employed in agriculture, or 30 per cent.	3,702,857 per
5-7ths constitute the remaining population, or 70 per cent.	9,357,143
	13,059,000
Fractional difference,	41,000
	13,100,000

Dr Paley states that agriculture is the *base* of all nati wealth and strength. It is equally the *security* of all revenue in the first instance, the soil must be viewed as responsible fo "*as the immediate* source of human provision."

"Let it always be remembered that agriculture is the im diate source of human provision; that trade conduces to production of provision *only as it promotes agriculture*; that whole system of commerce, vast and various as it is, hath other public importance than its subserviency to this end."

From the foregoing statements in proof of Dr Paley's assert it appears that, *by the superiority of our agriculture*, 2-7th agricultural produce, amounting to £34,285,714 : 5 : 8, or per cent. on the whole £120,000,000 annually is only consu n production, while 5-7ths, or 70 per cent. is, in England, thr nto the general market for consumption; but although 2- only is consumed directly by the agriculturists, at least 2- more is consumed or purchased in exchange by those who dependant on agriculture for support, making 60 per c This refers to England only: in other parts of the United K om the proportion is greater.

[illegible] of taxation, then, it appears that the agricult

t in England (or the soil, it may be said, through the occu- bears taxation on the amount of production, viz., to)00,000 per annum, every portion of the £120,000,000 axed, the occupiers being made chargeable for taxation, *he produce comes to maturity.*

charged (for the occupier becomes liable in the rent) for d-tax and repairs of buildings, and for the taxes on the dities with which the landed proprietor supplies himself ıe rent.

charged with the tithe, either in the shape of *additional* tithe-free, or with tithes, as a separate charge, on the land, the latter is not tithe-free.

charged, in certain instances, with government or assessed

charged with poor-rates, and in these rates pays the n on taxable articles consumed by the receivers of such

charged with taxation on all taxable articles consumed by ricultural labourers employed on the soil; and this is by Earl Fitzwilliam's Table of Wages, &c., in a tract by "*The Anti-Corn-Law League*," entitled "*Facts for* *s;*" the average money wages from 1797 to 1800 having ıly 7s. the week for agricultural labourers, whereas, from 1829, when the table closed, his Lordship states wages averaged 11s. per week.

charged with the taxation on all tradesmen's bills for the d repair of implements of husbandry, inasmuch as these ıed in price in proportion to taxation.

charged with highway rates, county rates, parochial sur- c.

charged, finally, with the taxation of the surplus value of duce left to the occupier, after receiving for annual pro- ıd paying all outgoings, to the extent of all he expends in ily in taxation, direct and indirect.

the Act of Parliament which abolishes "protection to ure" virtually annuls the revenue in the end, as the reve- ends upon agriculture, and agriculture upon due protec- ainst *the comparatively untaxed produce of the foreigner.*

ration and Home Colonization.—The following remarks e *John Bull* newspaper on these subjects, which are attract- e than an ordinary share of the public attention, contain so ood sense and feeling that we cannot refrain from quoting the hope that our readers will perceive the great difference in sentiments arising from a desire to make the con- f the emigrant comfortable in the foreign land to which betaken himself, till he can provide for himself by the

labour of his own hands, and the mercenary spirit of the projectors of emigration schemes, who care not for the fate of the emigrant in a foreign land, provided they can secure their own sordid remuneration :—

The melancholy condition of the labouring classes in this country is forcing itself more irresistibly, day by day, on the attention of the ruling orders of the community.

The two great questions of emigration and of home colonization, are, at length, fairly submitted to the consideration of the legislature ; and to the intimate character of these questions the presence of overwhelming distress will assuredly, ere long, direct no small share of public attention.

On the subject of emigration, this journal has frequently expressed its opinion.

Emigration is, obviously, the most wholesome and natural mode of extending the limits of an empire, as well as of strengthening its power and of multiplying its resources. In emigration, too, a portion of the labouring population may, at times, find amazingly profitable fields for the exercise of their energies.

Emigration, however, to be useful, must (as this journal has often attempted to shew) be conducted on an extensive scale, and in conformity with sound and comprehensive principles. Emigration must not be left to be conducted by land-jobbers ; nor must poor emigrants be left to the horrors of a struggle with starvation on the inhospitable shores of a new country—nor yet to the tender mercies of schemers who may have a pecuniary interest in "concentrating" (in Mr Gibbon Wakefield's phrase) the colonial population. The mother country must, above all things, if she would derive from emigration its highest advantages, avoid the semblance of casting away, as a worthless thing, any portion of her population. The mother country ought, on the contrary, to send forth her emigrating children, not in the character of useless and disowned fragments of the old society, but arranged in such an order, and governed by such relations as to present in miniature a copy of that social constitution which prevails at home. Emigration ought not, in short, to be looked on simply as the resource of starving and of broken-down labourers, nor yet as a social arrangement that affords occasion by which a scheming capitalist may extract wealth from the misery of men whom want has compelled to leave their native country. No ; if the mother country would derive strength from her colonies, the mother country must extend to emigrants all those aids and appliances which the national resources place at the disposal of her rulers. Emigration, therefore, ought to be conducted with due regard to a proper admixture of various orders of society. Capitalists ought to be encouraged, persons [illegible] and bred [illegible] emigrants to distant lands. Younger sons

f good family ought to be tempted to expend their energies in laying, wide and deep, the foundations of a yet more noble colonial empire. The refined, as well as the more useful arts, ought, in due proportion, to shed their lustre on every attempt at emigration. But, above all, every plan of emigration ought to be conducted under the sanction of the Established Church. Bishops, and subordinate clergymen, in the fitting proportion, ought to be appointed by government to supply the spiritual wants of the wanderers from the land of their birth.

Under such arrangements, emigration might be rendered conducive, in the highest degree, to the wellbeing of the mother country, as well as to the prosperity of the colonies themselves.

On such principles, however, emigration, in modern times, has never been conducted. Hitherto, emigration has been regarded as the resource of desperate individuals, or been turned to account by jobbers, who have traded in the misery of the poor creatures whom they have encouraged to abandon the land of their forefathers. Hence to the mass of the labourers of England the term "emigration" is suggestive of images the most revolting. Imprisonment—starvation—death by violence—seem to hundreds of thousands of our operatives preferable to removal, in the character of emigrants, from their native country.

In seeking to deal with the social evils that now surround us on all sides, no wise statesman will overlook or disregard the existence of these strong feelings on the part of our labouring classes.

The more intelligent of the operatives of this country have, for many years, been compelled, by the presence of dire distress, to ponder over the *causes* of their melancholy destitution. On this question of causes considerable diversity of opinion prevails among them; but as to the expediency of our remedial measure they are all agreed. All the suffering operatives of England do most fervently believe that their condition never can be permanently improved until their productive energies shall be brought to bear upon the land. All the suffering operatives in this country are, in short, warm supporters of plans of home colonization.

Before the labourers of England may be brought to contemplate even the wisest plans of emigration with other than feelings of the deepest distrust, these plans must be witnessed in action. Hitherto, as we have already stated, emigration has been conducted, either without a plan, or on plans utterly at variance with the dictates of honesty. The colonization scheme of Mr Edward Gibbon Wakefield, for instance, is a scheme ingeniously constructed; yet it is a scheme of which the tendencies are to perpetuate, in colonies founded on its principles, all those evils

from which emigrants from the land of their nativity are assı
to be anxious to escape. The only plans of colonization w(
of a Christian country—the only plans of colonization whicl
ever recommend themselves to the sympathies of the labour(
England—are plans which, in their operation, shall exten
new lands the action of our best home institutions, adminisl
in a spirit of justice, which shall offer fair chances of adv(
ment to industry and energy in various ranks—which shall n
tain, even from the commencement, a wholesome subordin(
among the different orders of emigrants—and which shall, a
all, secure, even in our newest colonies, full scope to those
gious influences which a Church Establishment is alone fitt(
impart.

Mr Ferrand brought the subject of home colonization u
the notice of the House of Commons. The following is the
stance of the honourable gentleman's plan:—

There are in the three kingdoms no less than 75,000,00
cultivable acres of land in a state of waste. There are
about 46,000,000 of those lands in cultivation and 30,000
uncultivated. He should propose that out of every hun(
acres in every parish, one-twentieth, or five acres out of e
hundred, should be allotted to the use of the poor. He sh
propose that this land should be for ever reserved to the u(
the poor; and that, with that object, it should be held by t
tees for their benefit, the said trustees being the rector of
parish, the lord of the manor, the churchwardens, and the (
seers.

* * * * * * *

The remainder of the land he should propose to allot to
use of the poor, to be divided into lots of such size and exter
shall be deemed most useful, no man being apportioned less t
a quarter of a rood. The expenses attending this allotmen
should propose to be paid out of the poor-rates; but the ex
of the enclosures, and consequently the outlay, in any one y
he should propose to leave for the decision of the ratepayer
public vestry assembled, and convened by public notice.
should also propose that the trustees should have the powe
exchanging allotments of equal or greater value previous to t
having been broken up, also of purchasing waste lands, with
consent of the ratepayers, if the extent of the original allotn
,^ the poor should hereafter be found inadequate. With
-ame sanction he should also propose that the trustees m
-xpend out of the poor-rates a sum of money not exceeding
·hould say, 3d. in the pound in any one year, in the erectio
;ottages on the allotments. They should also have the powe
easing all allotments for any term not exceeding twenty-one ye

he rent of the cottages to be at the fair annual rate of cottage rents within the parish. The waste lands he should propose to be let rent free for the first year, at half the value for the second year, and at a fair annual value for the third and every succeeding year. With respect to the products, he should propose that, first of all, the rents should go to remunerate the parishes for the expense of building cottages and enclosing allotments, and that after that the surplus should be annually paid into the poor-rate fund—an arrangement under which he felt quite confident that, in a very few years, not only the poor-rates, but the county and all parochial rates, would be paid off.

The practicability of this plan was called in question by several honourable members who followed Mr Ferrand in debate. Sir James Graham described it as merely a substitute for the present poor-rate.

Whether Mr Ferrand in pointing to the existing poor-rate, as constituting a fund sufficiently ample to sustain the expense of converting our pauperized manufacturing operatives into agricultural labourers, did not commit a grievous arithmetical error, may admit of doubt. It may be doubted, moreover, whether, without a very considerable change in Mr Ferrand's projected arrangements, his plans could be brought into action to any considerable extent. Sir James Graham, for instance, remarked truly, that "in those parts of the country where such allotments might be of service, the population is dense in its character, but there is no land to allot. It is already occupied; and where the waste land is situated the population is proportionably thin."

There is much force in these observations, so far as the mere details of the member for Knaresborough's plan are concerned; but the observations in question lose their force, if directed against a plan of home colonization on a more comprehensive scale.

What, let us ask, are the circumstances which at this moment impel legislators to deliberate on the expediency of sanctioning schemes of emigration and of home colonization?

Distress—deeper than ever was experienced before—pervades, at this moment, nearly all classes of the community. Tens of thousands of labourers are supported as paupers. Tens of thousands more are pining on insufficient wages. Crime is extending its ravages on all sides. Feelings of disaffection towards all our existing institutions are spreading among the great bulk of the population. The security of property is lessening day by day. Rebellion reared its head only a few months ago in the manufacturing districts. Fresh outbreaks are anticipated at no distant period by close observers of the times. No man expresses confident hopes that trade will, permanently, improve. Despair

is now descending rapidly on whole classes of men, who have hitherto refused to yield to despondency. All things, in fact, seem to indicate approaching change. All things appear to denote the advent of an alarming crisis in our social history.

For such a state of things ordinary remedies are obviously insufficient. We have already expressed our approbation of a plan of emigration, providing the plan shall be based on sound and comprehensive principles. But such a plan must, for the reason which we have already stated, be, for many years, utterly ineffective towards removing the pressure of distress in this country. Such a plan must, in short, be ineffective; because to all plans of emigration the great bulk of the labouring classes is violently opposed.

But, although the labourers of England are unwilling to become cultivators of colonial swamps, for the benefit of schemers who remain at home, (and these are, in the opinion of our operatives, the only results which plans of emigration are designed to secure,) the labourers of England are eager to be supplied with the means of cultivating the waste lands of their native country. Let food, shelter, and clothing, on a moderate scale, be provided for them, during the period which must elapse before their labour can be rendered productive, and the half-fed crowds who haunt our manufacturing towns will repair with delight to the bleakest moors of England, from which their energies may suffice, ultimately, to extract the means of independent subsistence.

To carry into effect such a system of home colonization would, undoubtedly, involve, at first, at all events, a heavy outlay. But the best possible scheme of emigration will, in like manner, involve a heavy outlay. Nay, the system by which we at present dispose of the labouring classes involves a heavy outlay—an outlay unattended by even the most remote prospect of an ultimately profitable return. *Now* we support tens of thousands of the labouring classes, unprofitably, as paupers. *Now* tens of thousands more support themselves—even more unprofitably to the community—by plunder. *Now* the thoughts and cherished theories of hundreds of thousands of operatives involve in their ultimate results the utter subversion of the institution of private property.

Does not such a state of things as we have attempted to describe inflict on the community losses far heavier than the most expensive system of home colonization would entail upon us? It seems scarcely to admit of doubt, moreover, that home colonization would, at no remote period, enable the labourers who might have recour[illegible] to repay to the state whatever advances the state migh[illegible] first instance [illegible]pply in aid of this mighty undertakin[illegible]

ome colonization would raise the value of human labour; unless the value of human labour can be greatly and per- ently raised above that miserable level to which trading mers have succeeded in depressing it, it were folly to close eyes to the melancholy fact that the security of all our exist- nstitutions must diminish with the lapse of every year.
wenty millions of money were applied to secure the emanci- on of the West Indian negroes. Scores of millions of money been lent to foreign states, and utterly lost. Scores of ons of money would be raised to-morrow, if the safety of the try should require us to go to war. Have the starving urers of England no claim on the administrators of those onal resources which the labourers of England have aided to te? Is the continued existence of our time-honoured institu- s not worth the sacrifice of a fragmentary portion of the onal wealth?

ow to Afford the necessary Supply of Air to the Roots of Plants.
Mr J. Main, Brompton.—The breaking up, or turning the ace of cultivated land, either by the plough, spade, or hoe, for reception of seeds or plants, is a process so universally prac- l and indispensable for the wellbeing of the crops intended to aised thereon, that it may be deemed incredible that such a mon and simple affair should not be universally understood. l yet it cannot be denied that many and frequent mistakes committed in this matter, and these must proceed either 1 indolence or ignorance.
.s the surface of the earth is the natural station for the gener- y of plants, and where they obtain the necessary elemental l requisite for their development and maturation, certain litions of the said surface are absolutely necessary. Humidity, t, and air, in due proportions, are indispensable, both to the ous roots which are extended in the earth and to the head ch is expanded in the air. There is more danger, however, a an excess of moisture than from the extremes of either heat ir; because, when the soil is saturated with water, the access he genial air and its gaseous properties is excluded, and the cate fibres, imprisoned and choked, it may be said for want breath, must, in such a case, necessarily languish. That a ous soil is requisite for the free growth of every plant is an m in cultivation, and on this axiom all our operations of ghing, trenching, digging, &c., are founded; and, that no ess of water should at any time remain to chill, sodden, and solidate the staple, draining in all its branches and modifica- s is had recourse to.
oils are various in quality, and particularly in texture and

consistency. The success of crops appears to depend as much on the texture of the land as upon any other property. For, where air and rain can permeate freely, a constant supply of both aqueous and gaseous nourishment is afforded, independently altogether of the richness of the soil, whether natural or artificial. While, on the other hand, if the soil be compact, baked hard by drought, in consequence of its having been previously laboured or stirred when too wet, no plant can possibly flourish. The conclusion, therefore, is, that the soil for any kind of crop should never be impervious to air from being saturated with water, nor impervious to both air and water from its dry adhesiveness.

Sandy soils, upon a gravelly or chalky subsoil, are never liable to be drenched with water but only for a very short time after heavy rain, or sudden thaw when snow is on the ground. All the water absorbed by such a soil sinks deep into the subsoil, and far below the roots of corn or any agricultural plant on the surface. Such a soil needs neither draining nor subsoil ploughing. Neither does it ever require to be exposed to the frosts of winter, or any kind of treatment by implements to produce amelioration. It is almost always in such an open friable state that it may be ploughed and sown at any season, without risk of being ploughed and harrowed into the condition of mud, or of being poached into the state of mortar by the horses' feet.

In some countries there are large tracts of such land, and on these farmers are generally fortunate men. The culture is easy, and executed at a moderate expense. The crops of turnips are heavy; and if, besides the ordinary supplies of dung and tail-dress, the farmers can manage to give their fields a liberal coat of marl or reducible clay every eighth or tenth year, the heart and fertility of the staple is maintained unimpaired for ages.

In such descriptions of land, however, it often happens that beds of clay lie alternately with those of sand at different depths beneath the surface. These beds of clay, if the general surface of the farm or field lies sloping, crop out at different distances below each other, and above each the surface staple will be either occasionally or constantly wet. If a pasture, rushes will appear accompanied by the worst grasses, and herbage produced that will certainly rot sheep, especially if introduced from drier pasturage. If the land be arable, the crops raised thereon will be unequal; on the wet places, the corn will be either too rank and inferior, or fail altogether. In such cases, efficient under-ground drainage is the remedy to get rid of the superfluous moisture either by gently-falling diagonal or direct channels. The proper direction of the drains depends on the depth, extent, and inclination of the beds of clay, and it is well to have a professional [illegible] unless the tenant has a sufficient know

of geology himself. It is surprising to those who know
tle of the nature of the various strata of the earth's sur-
how easy it is in some cases to get rid of surface water.
nstance, if there be wet and dry places on the same field,
wner may be assured that a bed of clay, or other kind of
impervious to water, lies beneath the wet, and a porous
il beneath the dry places. A drain of sufficient depth
d (and filled nearly to the surface with stones or loose gravel)
the wet to the dry places, will certainly render the whole dry.
y own practice, and acting on this principle, I have been in
cases very successful in laying arable fields dry. Two
I may mention as examples :—A field of eleven acres, of a
loam, suitable for wheat, beans, or indeed any other crop,
a hollow near one of the ends, which was every winter
with water, and ruinous to wheat or grass, very frequently
e extent of between two and three acres. This I resolved
ain. A neighbouring farmer predicted that the attempt
d be a failure; because his father, when tenant, sunk a shaft
e depth of above seventy feet, in the lowest dip of the hollow,
filled it with stones, expecting that this would form a *swal-*
for all the rain and melted snow retained by the hollow.
this expectation was not realized; the water first filled the
and then flowed over the land as before. The cause was
comprehended: the pit did not reach to the chalk-rock,
lid it pierce through any porous stratum; its loamy sides
ottom were perfectly water-tight, so that little or none could
e.

y plan was different. I saw marks in an adjacent field of
e chalk had been drawn at some former time; thither I
ed a stone-filled drain below the ploughshare, from the lowest
f the hollow; and, when the water had accumulated, it ran
rds the old chalk-pit; but totally disappeared long before ar-
g at the place, and thus was a valuable field laid dry. Another
e field contained a pond, which very often overflowed its
daries. Lower ground was at the distance of half-a-mile;
he expense of forming so long a drain prevented all attempts
t rid of the annoyance. I advised the tenant to dig a deep
from the pond up into a high bank of gravel, into which
ater oozed away immediately; and ever after carried off all
s. By this simple expedient a large piece of excellent land
eclaimed and brought into a regular course of culture at a
trifling expense.

is by such means that land, naturally friable and loose in
re, may be relieved of superabundant water, and give admit-
to the necessary supplies of air at all times. I have
ly observed that sandy soils require no exposure for the

purpose of reducing adhesiveness either by the action of frost machinery; and yet we often see such land carefully fallowed in the autumn, and even laid in ridges, to receive the advantag supposed to be imparted to it by the contact of frosty air. Th such an idea, namely, that arable land is benefited by exposu to frosty air, has been long entertained, is evident from wh has been written on the subject by old authors. Even our am able poet, Thomson, in one of the flights of his pregnant imag nation, says—

> "The frost-concocted glebe
> Draws in abundant vegetable soul,
> And gathers vigour for the coming year."—WINTER.

Shewing that the notion was held by philosophers as well cultivators; and, at the present time, there are many among th latter who mistake the disrupting, ameliorating effects of fro on tenacious soils for its enriching property, which they imagine communicated to all soils. But this is a mistake; the less ligh sandy soils are exposed to the sun and air, the less are the exhausted of their humid riches. Their best qualities are liable to be washed away by winter rains as dissipated by th summer sun; and, therefore, they cannot be too close and lev during winter if it is intended that they should be cropped in th spring.

I have often noticed the mismanagement of a field of light so by the following culture:—It was fallowed, cleaned, dunge ploughed, and sown with tankard turnips about the middle June. The crop was abundant, and a flock of full-mouthe wethers was put on in the end of September. Within a mont the turnips were eaten off, and the field was ploughed into sing 'bout ridges to lie for the winter. In April, the ridges we ploughed and harrowed down, and barley and seeds were sow Both rose well; but, throughout the summer growth, the ridg were as visible in the crop as they were after the plough, th centres of the ridges bearing the finest and strongest plants the crop. And the reason was obvious: the centres of th ridges came up fresh, moist, and mellow, while the intervals we filled with the bleached dry crests of the ridges, which, thoug more pulverized, were much less fertile and stimulating tha the fresher portions of the surface. Hence it was quite evide that, if the whole field had been permitted to lie undisturbed ti the spring, the crop would have risen more equally and muc more vigorously. I have seen fields of similar soil sown wit oats after wheat—a bad custom certainly, and as badly executed- the wheat-stubble being ploughed in October, and the oats sow and harrowed in February, whereas, had the wheat-stubble bee only scuffled off and harrowed to bring up a crop of seed weed

and so rested till February or March, and then ploughed and sown, the crop of oats would have been much more abundant both in straw and corn than by the former method.

Here it is necessary to observe that, as I set out with shewing how absolutely necessary an open porous soil is to all vegetation, and no measures being recommended in the above statements for that purpose, but rather the contrary, it is to be remembered that I have been treating of sandy land, which is at all times, except when too wet, sufficiently porous for the reception of air. But in other descriptions of soil, such as that whose particles are minute and have a tendency to adhere closely together, either by gravitating subsidence or by a flow of rain water —in such a case, every practicable means must be taken to alter and break this solidifying nature of the staple, in order to admit a free range of air and the gases it contains.

There are many intermediate descriptions of soil between sand and clay, and all of these, according as they approach to the one extreme or the other, require a peculiar management. But the grand object is to work the soil in such a manner that it shall always be pervious to air, rain, and all atmospheric influences. And this result is obtained by the *timely* application of the implements rather than by the efficiency of the implements themselves. The soil is sometimes in a fit state to be worked, and very often it is not. Under such circumstances the judgment of the cultivator must be exercised. The condition of the land depends very much on the season and character of the weather; and on this account seed-time cannot always be commenced at the times which would be most convenient to the farmer. In such a case, he must wait until the land is in right order to be stirred; and that state is, when it is neither too wet nor too dry. I am alluding to land which has either been thoroughly drained or which needs no draining, and is only affected by the season, whether very wet or very dry. But as the exact time cannot always be hit upon, it is better that the arable surface be rather too dry than too wet when moved. Because, if too dry, it may be reduced to the necessary fineness by labour, and will then be in the best possible state for the reception of seeds; the interstices between the particles of the soil being filled with air, amid which the imbedded seeds germinate in the greatest vigour. But if the soil be too wet when moved, and especially by the pressing or pushing action of the plough, it acquires, from the excess of water, a state of fluidity like mortar, and settles down again so compactly, that no seed laid therein can be developed in a healthy condition, in consequence of the want of air.

That the contact of air to the roots of plants was always considered necessary, is evident from old writings; but the fact has

never been so generally noticed and acted upon as it is now. The first and most striking instance confirmatory of the opinion was the fact of large full-grown ornamental forest trees having been killed by their roots being too deeply covered up with earth when levelling lawns; and planters and gardeners have been long aware of the injurious effects of planting as well as sowing too deep. The same individuals formerly fancied that their prepared composts, for exotic or favourite flowering plants, could not be too finely sifted for their reception, whether in pots, or in the open ground. But slovenly or careless management in these particulars shewed that too much nicety of execution was not at all necessary. Sifting the composts was given up, and composts made up chiefly of nodules of turf, broken stone, brick rubbish, &c., are substituted with evident success; and the cause is obvious—when the compost is sifted, it becomes a solid mass, especially after it is watered, and repulsive of all atmospheric influences, whereas among the loose materials, a considerable body of air reposes, and in this the more active fibres extend themselves much more luxuriantly than they do in compact soil.

The gardener's improved practice is only another proof how much a porous soil and presence of air are necessary to the roots of plants; and yet we often see the most luxuriant vegetation produced by soils which are apparently very close in texture; viz., alluvial soils and fertile clays. Both these descriptions of soil being composed of the finest atoms, become exceedingly close and compact if undisturbed; but when ploughed, or otherwise moved periodically, the stirred portion attracts as much of the qualities of the air as suffices for the following crop. It is rather remarkable that, while oak thrives best on a clayey subsoil, it does not seem to affect rich alluvial land; and this I imagine to be entirely owing to its closeness of texture preventing all access of air to the place of the roots.

Aquatic plants, which live entirely submerged, although defended from external air, receive as much as they need from the surrounding water, which always contains a notable measure, besides nutritive bodies in solution, which form the pabulum of plants, whether aquatic or terrestrial.

Another tribe of plants are attached to earth, but so slightly that their system of roots is nothing compared with the bulky heads sustained; and as these plants are mostly found on rocks or on the driest tracts of country, it is evident that the greatest portion of their nutriment is drawn from the atmosphere. Another tribe of curious and beautiful flowering plants is called Epiphytes; because they attach themselves to the stems and branches of trees, not to sustain themselves by extracting their juices but to be supported in the deep shade and moist air of

ick tropical woods. Some of these are called *air plants*, and row as well in a basket without earth, suspended in a warm, amp, shady place, as if they were in their native habitat.

Thus we see that air is particularly necessary to plants, and as uch so to the roots as to the head and foliage; and it is this fact, s already observed, that justifies all the means of cultivation which we have recourse to with a view of rendering the staple more loose, and consequently more permeable to all atmospheric influences.

There is one circumstance, however, which deserves to be noticed along with these general remarks: it is this—that all seeds require to be closely embedded in the soil, that is, they should be in close contact with the mould all round; and, that this should be completely secured, some seeds require to be laid in *heavy*, as wheat for instance. Now we have only to consider that as the soil has been previously prepared, and more or less reduced to the finest practicable state, a considerable volume of air is incorporated therewith, and that this air, according to its temperature and the moisture of the soil, facilitates the germination of the seed, and continues to assist the development of the plant. To obtain this close embedding of the seed, it is the practice to tread it in—a practice which is found of service to wheat, pease, beans, and almost all small seeds; but which would be of no avail without the previous disruption and aeration of the soil.

All these matters premised, it only remains to conclude with a general declaration that, in all our practices and means employed for the amelioration of the land, everything that can be added or taken away, every operation performed, and every implement used in the culture, should all have for their ultimate object, either directly or indirectly, the breaking up of the compact and impervious surface, so that copious and constant supplies of air may be freely admitted to the roots of the plants.

On Canker and Gum in Fruit Trees. By Mr John Pearson, Kinlet, near Bewdley.—My views respecting the origin of canker and gum in fruit and forest trees, which I previously laid before the readers of this Journal, in vol. xi. p. 379, remain unchanged by time and experience; and every incident which chance has presented to me in reference to that matter, and every little experiment which I have practised since, have so far convinced me of the correctness of my position on this subject, that nothing short of direct proof to the contrary, founded on experiment, will ever move me from it. The Bedfordshire foundling apple trees, which I mentioned in my last communication, are still standing; and in the moist season of 1841 they grew vigorously, without anything having been applied to their roots. But at the

winter pruning, I found the cuticle of their young shoots risen in small blisters, from base to apex; and, when cut open, they were found full of a kind of cankerous perenchymous matter, in appearance like that of a rotten apple before it turns black. The greater portion of these shoots were cut away, and a few were left, to see what would befall them the year following. The last year being comparatively dry and warm, these trees grew less vigorously, and the young wood became ripe, but, except in very few instances, no blisters could be found. The blistered shoots, however, of 1841, which were left on the trees, presented a most hideous appearance, being full of large patches of canker; which proved admirable retreats for various insects, and, in some instances, death had established its claim. Now, were it possible to empannel twelve persons out of any of our great cities who had never seen an apple tree, how could they, with the above evidence before them, but "bring it in" that these branches died by affection of canker, brought on by atmospheric influence? Or, suppose for a moment that a jury could be empanneled who are as expert in vegetable pathology as a Knight, a Dutrochet, a Loudon, or a Lindley, how could they "bring it in" otherwise?

In 1841, the peach trees here suffered severely by gum or canker. Some old trees had to be replaced by young ones. I have tried various soils here for the peach, some in shallow borders, others in deep ones; some thoroughly drained, others not drained at all—as the subsoil is dry—in all of which the roots are perfectly healthy, while their branches suffer by canker in all the different soils and in all the different forms of border. These experiments inclined me to the belief that the root of the disease did not rest in the soil, any further than that a soil for any kind o tree to grow in should be of such a composition as to produce a tre sufficiently vigorous for the purpose intended. No matter whethe it is intended for timber, fruit, or flowers only. I have state that, if the peach trees here were covered with glass, it would era dicate or prevent the disease. In this, I might, in one sense, hav been mistaken to a certain extent. I have stated, however, i another place, that I would engage to have two peach-house everything as to soil and situation being the same, and I would al most destroy the trees in one house by artificial gum or canker, an that the trees in the other house should be nearly, if not alto gether, free from it. This, I admit, is a very bold assertion but the following experiment enables me to make it wit some degree of confidence:—I had a small peach-tree growin (or rather dying) against a south wall, which was so affecte with disease that it had only two living buds on it. I potted i [illegible] .ne peach-house, to see if I could restore it to any [illegible] One of the buds was knocked off b

accident; the other bud grew, and did pretty well. The second year, I planted it against the west end of the house—its aspect being east. Having, as I fancied, traced the disease to external causes, I disbudded, as we gardeners term it, two buds on the little tree in question. The one bud was pinched off, leaving one small leaf to it; the other was pinched off without leaving a leaf; but leaving the nucleus or base of the bud; and, as is well known to practical cultivators of the peach, buds treated in the latter mode never put forth again. Over these denuded buds I fixed an open vessel of clear rain water, in which I placed a wetted worsted thread, one end of it hanging over the side of the vessel in a perpendicular line with the buds. By the well-known law of attraction in this case, the thread dripped its regular supply of water on the denuded buds, which were allowed to be kept moist, by this means, for two or three days at a time. Then the thread was removed, and the buds allowed to be dry for a day or two, when the water was again applied; and thus we proceeded with those alternations for a short time, occasionally examining the buds. On the first examination, I could not perceive anything remarkable in their appearance; but, by and by, I fancied I saw a slight discolouration of the outward bark, extending about an inch below each bud. Soon after this, fancy became certainty, by the bark becoming darker in colour, and small globules of gum, as clear as drops of rain in the sunbeam, exuding from the bark, about an inch below each bud. After keeping them dry for a few days, the water was again applied, and in a short time the gum took its well-known dark amber colour, and the bark its well-known brown. Thus the disease was fully established artificially; and here the branch is on the tree for any person to see—many of my neighbours having already seen it. At the present time there is gum hanging on the said branch; and any stranger would take it for the disease in its natural way, as there is no discernible difference in it. In fact, I do not think that the branch will live much longer, as the disease has almost extended round it. I had, for years, felt pretty certain that by far the greater number of cases of the disease made their first appearance at or near the buds in the peach tree, but never could decide exactly how the dawn of its existence took place till I had the satisfaction of witnessing it in the above simple experiment.

In peach trees, generally speaking, and probably in many other trees, natives of warmer climates than ours, there are always more or less of what gardeners term abortive buds, both of wood-buds and blossom-buds. This abortiveness establishes itself earlier or later in the autumn, or probably from the viscissitudes of a severe winter, such as the last winter, for instance;

when in the latter part of January we had here April-like weather, but on the 15th, 16th, and 17th of February, the thermometer sunk to 17° below freezing, which rendered all the blossom-buds on four apricot trees abortive, notwithstanding their growing against a south wall. The abortive wood-buds are more numerous in those trees which are rather declining in vigour, or in those branches of a young tree which has been robbed of its portion of nourishment by its more robust neighbours, or, which is often the case, on branches which have borne too much fruit. It matters little, however, in this case, how these abortive buds are established; the fact is, they are established, and there the disease commences its silent but certain and destructive operations. When the buds are dead, they, like all dead vegetable matter, become powerful absorbents of water, whether of the finely divided vapours of the atmosphere, or the more condensed form of rain water—hence, after rain, they become gorged with water. So long as these dead buds rest on the trees, there is little or no cicatrization between the dead buds and the branches which they rest on, or, at all events, not before they have been saturated with moisture, which first saturation, after death has taken place, enters into the most incipient fermentation with the sap of the plant, at the connection between the dead bud and the living branch. By the alternations of wintery weather, from wet to dry, and wet to frost, and frost to hot sunshine, as spring approaches, the frost, freezing the water in the dead buds, enlarges their capacity for holding the destructive element, which assists in carrying on the fermentation between the alburnum and the bark. In this infant stage of the disease, it is not discernible by ordinary observation, as the bark does not change its colour for some time after the disease has entered the system of the plant, and if dry weather follow the recent establishment of it, its ravages are arrested for a time, but which, nevertheless, progresses as the sap attenuates, when the disease manifests itself to the eyes of every beholder, but to none more than to the eyes of the gardener, who has carefully prepared his well-drained border, as a preventive or cure of the pest in question, and who finds, as I have found, that the whole "root doctrine" as a cure of canker on the head of the tree is next to a fallacy, save, as I have above stated, that a soil should possess ingredients which will produce a tree sufficiently vigorous for the purpose intended, avoiding that state of exuberance which prevents it.

There are, however, some other features of the disease met with during the summer which cannot be assigned to abortive buds for their origin. Such, for instance, as a luxuriant shoot being attacked by it—and, if not seen in time, it soon destroys the branch but if the diseased part be cut out with a sharp knife, the economy

of the shoot proceeds as though it had not been attacked. In some instances, some of the smaller young shoots will be attacked when they are but a few inches in length. The former case may be attributed to the punctures of insects, or other accidents, when the water enters, and fermentation commences rapidly, having the heat of summer to assist it in so doing. In the latter case, it may easily be traced to buds which have been partially affected, that is, buds which have not been quite abortive, and in which the disease has only slightly manifested itself, and, when the bud shoots out, it carries the disease (only on the bark) with it, not by absorption, but by extension. That the disease may be transmitted after its establisment, by the force of absorption or the rising of the sap, just as coloured infusions are taken up by the living vegetable, would seem probable; but I have never been able to trace it. If ever it is transmitted, it must be in its early stages, before gum is established, as afterwards its so doing seems impossible. There are cases of the disease, however, in old branches of long standing, which, from their lack of sap, seldom if ever produce gum; in this case it may be transmissible by absorption, but even here I have not been able to trace it. It may, and, no doubt, has been supposed that it is the disease which renders the buds abortive in the first instance; the above experiment, and the fact that the abortive buds in a peach-house frequently drop out of their receptacle, leaving it completely healed, go to prove the contrary.

During fifteen years' labour in this locality, so unpropitious for the peach and moor-park apricot, where, though I have produced abundance of fruit, I never could keep a handsome tree on the south walls for any length of time, I have frequently turned my attention to the doctrine, so frequently set forth in this Journal of the excreting powers of plants, and which now appears to be acknowledged as one of the original curses (coming with the weeds) on the earth. Raspberry bushes are supposed, by the supporters of this doctrine, to render the soil foul in an extraordinary short time by their excretions. I presume, however, that their powers may have been mistaken in this respect; for the quantity of seeds which the raspberry annually bears, if carried off the land with the foliage and prunings, must in time render it barren. In the year 1837, a plantation of raspberries here gave up the ghost in the month of March. On examination, I found that the buds had *started*, but they had, for some reason or other, come to a dead stand. I prepared some ground adjoining the old, and formed a new plantation, nursing the old plants at the same time. They all grew pretty well till the spring of 1841, when part of both the old and new plantation of raspberries died in the same manner as the old ones did in the first instance. Thus

it must be evident that, in this case, the young plantation could not have rendered the ground foul, by excretions, in so short a time, and I, therefore, from this, and the appearances which the cuticle of the vines then presented, refer the origin of the disease to atmospheric influence.

On the Waste pieces of Land in Cultivated Fields. By Mr PETER MACKENZIE, Stirling.—When a piece of ground is enclosed for a garden, it is with the intention that every square foot of it should be put to some useful purpose; for from the centre of the ground to the bottom of the wall vegetation will thrive; and persons accustomed to cultivate every part of the ground of which they have charge, often wonder, as they pass along the highways and byways of their neighbourhood, why so much land is allowed to remain undisturbed, in what is considered well-cultivated fields. The ground I mean is that which is sometimes called the borders of the field. I have often inquired for a reason why it is not brought into cultivation as well as the rest of the land, and have never received anything like a satisfactory answer. I have been told by some that they have just been accustomed to such things, and think no more about it; by others, that they do not like to go too near the hedges, for fear of destroying the roots of the thorns—but a little reflection soon convinced them that the leading roots of quicksets are generally placed beyond the reach of the plough; and it will be found that the root of a healthy hedge will not be confined to the space that is left unbroken up, but will often be found in the ploughed land. I think it could easily be shown that the farmer is a great loser by allowing so much of his land to remain in an uncultivated state; he must pay for it all, and it must be a great drawback on the productive part of the farm to make up for the deficiency of the unproductive. The space left by the plough untouched is, at least, three feet from the fence, and where open ditches are left in the field it is much more. Supposing a field to be 100 yards, by 500, this will give ten acres, one rood, twelve poles, twenty-seven yards; and with a border three feet wide, left unploughed, will take from it 1200 square yards, which is about one rood; and if we take fields of less size than ten acres, the increase of waste land will be greatly augmented. But, taking it at one rood to every ten acres, this will give two and a-half acres to every 100 acres; this is surely too much land to be allowed to be in a state which is worse than useless, for we will be able to shew that it has a very baneful effect upon the cultivated crop of the farmer; and if we extend our calculation to the 15,000,000 of acres in Britain that are employed in the cultivation of wheat, barley, rye, oats, beans, ... clover, rye-grass, roots, and cabbages, by the plough, it will

found that an enormous quantity of land is in a great measure st, and I believe the waste is greater in many parts of England an in Scotland. When we bear in mind that many of the fields re small, and separated from one another by enormous double edges, surely something might be done to lessen the quantity of and that is, from year to year, permitted to be unproductive; ive acres for every 300 acres is worth the looking after, and and, too, in most cases the best in the country. Supposing the and to be, on an average, worth £2 per acre, and the farm consisting of 200 acres, what does the farmer get in return for his £10 of rent which he pays for the borders of his fields? The botanist would, perhaps, meet with the richest harvest; he would not be long in collecting 100 or 150 species of plants, all more or less injurious to the farmer. Among the most conspicuous will be the spear thistle, *Cnicus lanceolotus*, common ragwort, *Senecio Jacobæa*, black knapweed, *Centaurea nigra*, and many others that might be named, that prove a lasting scourge to the land wherever they are permitted to multiply. When they are allowed to ripen their seeds, the winds of summer and autumn disperse them over the country; and, although they do not make much appearance at first, they are not the less sure of coming at their appointed season. Those of them that are biennial and perennial plants, will make little show for a time; but, when the second year of their existence comes round, they will shew themselves in gay colours, and, if allowed to remain undisturbed, will scatter a numerous progeny around them ere they die. The nourishment that docks, thistles, and ragworts extract from some fields must be very great; for in some pastures they are very abundant. So convinced was a cottager of the evil effects of permitting weeds to grow and seed among his crops, that he not only kept them out of his own garden, but assisted in destroying those of his neighbours, that they might not seed and come over upon him. By a little extra labour, much land might be reclaimed from the borders of fields, and, instead of proving a loss to the cultivator, might become a benefit to the country; for it shews but an imperfect state of cultivation when so many enemies to the crops are permitted to live and die unmolested. In gardens, as well as in fields, the destruction of weeds is often very imperfectly gone about; there are some weeds, such as the *Poa annua*, groundsel, and chickweed, that are constantly shedding their seeds, and remaining also in flower at the same time; and, if particular attention be not observed, the old weeds will not be long off the ground before another race will be pushing their way to supply the room of those that had been removed; and, if they are only left for a short time, they will play the part which their fore-

fathers did before them—shed their seed—and, if left undisturbed, would soon become possessors of the land.

One important step towards the eradication of agricultural weeds, would be to have as few open ditches as possible in fields under cultivation. Some time ago, I was told, by one of the leading agriculturists of Britain, that there should be none; for they are not required where land is properly drained. Ditches are commonly formed where thorn hedges are planted, in order to supply earth for the benefit of the roots of the plants; but it is allowed by many farmers that, if the land be well prepared, quickset hedges will thrive better in soil that is not thrown up in the usual way of planting, the roots not being so far from the influence of the sun or air as those that are planted in the common way, and that they will seek nourishment from both the fields which they divide, instead of being confined to one. Open ditches are often found to be very inconvenient when a hedge requires its annual cutting; a ditch four feet wide is too much to stride across and work freely, and, in many cases, the scarsement next the hedge, by frequent cleaning, and the action of the weather, is worn away, so that the person who works with the switching-bill has to stand in the ditch; and when the ditch is two and a-half feet deep, and the hedge four feet high, the work is both unpleasant and slowly performed; for the highest part of the fence is the place where the shoots are strongest, and, of course, most difficult to cut. It will be seen that more than one advantage will be gained by banishing open ditches from fields where it can conveniently be done, and, in many cases, it can be accomplished with little expense and trouble. They can be made into drains, and filled with such materials as are commonly used in draining land, and the filling with soil is done very simply—by means of the plough taking earth from the headlands or sides of the field, so that, in a short time, the farmer may have the cultivated part of his farm considerably enlarged at very little expense; for I have been informed, by those who have tried the experiment, that they were more than paid for their trouble by the first year's crop. More land could be broken up by the plough than is commonly done. It is the practice of some farmers, after ploughing as much as can be properly done by two horses, afterwards to use one, and by altering the line of draught, are enabled to come a little nearer to the fence. Still there is some land left—could it not be brought into cultivation in the same manner that the acute angles of fields are managed, namely, by digging? A labourer or two would not be very long in digging what may be left by the plough; they could do it on day's wages or piece work, as may be found answerable. It is done by nurserymen and market-gardeners, who have generally higher rents to pay for their land than far-

rs, and if they find a remuneration for their outlay, would it t be profitable also for the agriculturist? It would increase the oduce of the farm in that which would be useful, and also cut f the source from which many of the foes of the cultivated crops re propagated; and the nearer the farm can be brought to that f a well-cultivated garden the better will it be for the producers of food as well as for the consumers; and surely it would add to the prosperity of the country, when, instead of the thistle shall come up the wheat, and, instead of the cockle, shall come up the barley. If such simple means were adopted for increasing the produce of the farm, it would enable many tenants to look forward with a lighter heart towards the rent-day, and also banish from their grounds many of the enemies that assail the labours of their hands.

A Gigantic German Green.—There was growing, in 1842, in the garden of Mr John Murray, Easter Newport, Fife, a plant of German greens of extraordinary dimensions. It was planted about four years ago, in the ordinary way, in a corner of a plot, and, at the time above specified, had attained to the following size:—it covered an oblong piece of ground twenty-seven feet in circumference. It sent forth seven main branches, which supported other sixty-one branches, five of which bore seed in 1842, and in September of that year the entire plant was in a healthy growing condition.

				F.	I.	
The 1st branch bore	11 stems,	which measured		9	9	in length.
2d	...	8	...	7	3	...
3d	...	13	...	7	6	...
4th	...	15	...	10	0	...
5th	...	3	...	7	2	...
6th	...	10	...	6	0	...
7th	...	1	...	3	0	...

A Mode of Destroying the Gooseberry Caterpillar. By Mr DAVID BAILLIE, Gardener, Tayfield, Fife.—Having observed that the gooseberry caterpillar (*Nematus grossulariatæ*) was seldom seen near whin or broom plants, it occurred to a neighbour of the writer to form a decoction of either of these plants, and use it for the destruction of that pest of gooseberry bushes which might be attacked by it at a distance from either the whin or the broom. Accordingly, he choped and bruised a sheetful of the sprays of the whin, and boiled them in a boiler containing about forty-two imperial gallons of water, until the liquor became a strong decoction, and which, on becoming cold, he distributed over 432 gooseberry bushes. Most of the insects were destroyed by the application; but a few of the strongest having attempted to ascend the bushes, he made another boilerful of the decoction, and succeeded in completely destroying them all.

On the Advantages of Proper Smearing, and Observations on New Salves. By Mr WILLIAM HOGG, Stobohope.—It is the established opinion of storemasters and shepherds that smearing sheep with some mixture at Martinmas should secure to the animal the following advantages:—Protection from winter's cold, sleets, and snow-drift—nourishment to the wool—and the destruction of vermin; in proportion as the mixture employed fails to procure these benefits it is insufficient. All extracts from the pine, whether simple or compounded with other materials to make them applicable to wools, ensure the first and last of these, that is, they repel wet, and a small sprinkling of them among the wool is directly fatal to the insects which infest sheep; but these extracts, unless mixed with emollient substances, impart no nourishment to wool, farther than that, by closing the fleece against winter's rains and sleets, they prevent it from being too much washed, and, by the expulsion of vermin, prevent the waste and destruction of this substance by them; and, lastly, grease or greasy compounds, and all animal oils, are favourable for its growth; but no simple nor compound substance has yet been discovered which completely secures all the three advantages. The old mixture, tar and grease, affords them more perfectly than any that has yet been discovered. Tar, however, leaves an indelible stain on the wool, which the ingenuity of man has never yet been able to extract till it is in the dye, and then it brings along with it part of the colouring materials; but as this mixture keeps sheep dry, warm, and comfortable, it has been, and is likely to continue to be, used in all cold stormy districts, and they are not the storemasters' friend who, on such situations, advise its discontinuance. The animal is three times the value of its wool; its health and thriving lies at the foundation of all improvements of its own kind—of all future profits, either of its wool or other produce. Hence the great necessity of keeping the animal healthy, vigorous, and prosperous; and, as leanness by the rigours of winter, and death brought on by leanness, are the principal evils the storemaster has to fear, from these considerations may be seen the supreme necessity of adopting that mixture best adapted to assist his flocks through the protracted hardships of a severe winter.

Advocates for the new fugitive salves will say, "Sheep which have been paired or salved with the new mixtures have come through winter in as high condition as ever they were known to do under the old regimen." So I believe they have, but, since new salves began to be used, have not sheep pastures been better drained? Is there not a more abundant and a far more nutritious sward of grass on the hills? Have not march-dykes, and dykes separating the arable from the pasture land, been put up? And do not sheep now pasture more at ease and less disturbed than

when the shepherd and his dog, who were the occasion of much noise and incessant fatigue both to himself and the flock, formed the only means of separation? Are not these important improvements? And ought not sheep stocks who have the benefit of these advantages to be better than formerly? But the new salves will overbalance these advantages; for, let any person rationally consider what benefit can be expected from a mixture which costs only three farthings or a penny per sheep.* The materials of which it is composed must be poor and worthless—its advantage to sheep unimportant, in sundry cases even injurious—it is a cheat upon the poor creature to send it to the stormy hills under such an insufficient covering—and it is an insult to any man's judgment who allows himself to be persuaded that the new mixtures now used are sufficient to answer the purposes for which smearing is intended.

All the European tars, especially that from Norway, have been remarkable for their blackness, strength, and drossiness: this last adjunct is not discernible till the finer and more soluble part of the tar has, along with the greasy part of the mixture, and by the heat of the animal's body, been diffused round the carcase. It then appears in a clammy, clotted condition among the wool, where it rests till spring. The heat of the season now dries it into a mouldering state, and it is principally this tarry dreg which gives that zone of pollution to the fleece for which tarry wool is so much hated; but this dirty sediment, though detestable in its final consequences, is the main material which closes the wool, and keeps it firm and compact round the animal in the greatest tempest. When the American tar began to be used, it was whiter, milder, and softer, not so searching for the constitution, and far more free from sediment than that from the north of Europe; but just as the storemaster was about to make this tar the basis of a smearing composition, the country was all at once inundated with white new salves, sundry of them containing no ingredient which could be serviceable either for sheep or wool. The materials of others were purposely kept a secret, the inventor persuading himself he would make a fortune by the discovery; but, alas! they have scarcely maintained a character for one year: yet there is no want of a new supply; for, like the many-headed hydra, no sooner is one dismissed as useless, than another starts up in its place, generally with some epithet in its designation expressive of superiority. I really wonder how storemasters can be gulled, year after year, by such stratagems; they cer-

* We cannot admit, in this instance, the logical accuracy of our experienced correspondent. The ease with which a substance of this kind may be obtained is no proof, *in itself*, of its worthlessness; it forms, on the contrary, a high commendation. If equal to other substances, in every other respect, the advantage of cheapness ought to be considered as giving it a decided preference over them.—EDITOR.

tainly know as well as any description of persons can know, what is most suitable for both sheep and wool, and till they take the business into their own hands, and compound for themselves, there will be no end of this chicanery.

I may notice here that there was one of the new salves which was truly valuable. I assisted both at laying it on the sheep, and had charge of part of them through winter: they were near 1000, and were mountain sheep. In enumerating the materials, I shall notice the method of compounding them:—To 18 pints of clear train oil put 33 ℔ of refined tallow before the mixture cool, and, before the stirring is finished, add ¾ of a pint of the spirit of turpentine; this forms a pure white ointment, and it gives not the smallest stain to the wool. The greatest danger to be apprehended is from the soil; if this is drossy, it is apt to give a yellow tinge to the fleece; this is, however, very slight, no deeper than what an abundant yolk would give wool—and I believe in many cases it is mistaken for this secretion. It, no doubt, augments this substance, and perhaps is aiding, along with this natural juice, in the subsequent operations to which wool is subjected. When this composition cools and stiffens, it is ready for laying on; this is done the same way as with the old mixture. Shepherds generally smear about twenty-five in a day, and there cannot with safety any more be expected. Much of the work is hidden among wool; there is a possibility of neglecting it, and the fault be not discovered till the sheep are on the hill—and not even then, till vermin nestle on the missed parts, and the irritation caused by their crowding together causes the wool to peel away; hence is should be leisurely, carefully, and faithfully done. This ointment, for the suppression of vermin, comes before any composition I have yet seen, even the old mixture not excepted. The above quantity should smear about 100 sheep. It costs about 3½d. or 4d. per sheep. I must also here state that it is quite deficient in repelling cold and wet. Sheep, though ever so faithfully smeared with it, drench easily and often to the skin, and a hasty puff of wind opens the wool immediately to the naked pelt.

I think, taking American tar for a basis, a composition might be formed which would nearly answer all the purposes of good smearing, and the wool not be much sullied; for the *blae* colour which this tar gives wool would, I think, be small obstruction either to its future operations or its taking on the bright dyes, especially when we consider that it holds little or no dreg, and, when tried at home for domestic purposes, the sedimentary part has not been ill to extract, even by the old and artless method of scouring. Having not much sediment, it is nearly all expended in its diffusion round the sheep, along with the greasy part of the mixture.

Except with the excessively parsimonious or careless storemaster, the new, white, cold mixtures never can come into use as salves for smearing. With the former, the cheapness of the materials and the facility with which they can be applied, will, no doubt, be an inducement for their continuation; with the latter, that natural apathy or sluggishness, which disposes to neglect other improvements, will also induce him to disregard this; but by the judicious, the active, and the anxious storemaster, they cannot be long employed in the form in which they are at this time presented. Every one of them, without exception, is destitute of any ingredient, or at least contains it in very small quantity, which is calculated to close the fleece previous to the setting in of winter; and the principal benefit derived from smearing is keeping the animal warm and comfortable during the rigours of that season. To make this more obvious to the inattentive farmer, I may observe that nature does a great deal in furnishing the animal with wool preparatory to the setting in of winter. It grows in that direction, and in the appropriate quantity, where the wearer needs it most for defence and clothing; and each pile of wool, as it grows, (at least in a thriving sheep,) is anointed with an unctuous oily secretion, which holds every fibre of wool in its place and beside its fellows. This natural cement is sufficient to throw aside the rains and mists which, through summer, visit all alpine pastures; but, for the snow drift, incessant rains, and tempests of winter, it is insufficient as a defence; and the artificial unguent, composed and applied by man, comes to its assistance. This extinguishes the natural oil; and, by imperceptible advances, at least if a sheep is rightly smeared, creeps to the top of every pile of wool; and, if it have not some tenacity in its composition, it is good for nothing—nay, it is worse; it destroys the natural juice in the wool, and is incapable of again closing it against winter. By the destruction of the natural yolk, the filaments of wool have not only lost their original connection, but, in order to deposit the artificial salve, the wool must be perfectly and completely opened to the bottom, where the thin white salves are employed. This opening never again closes up. The superior flakes of wool, indeed, overlie the inferior; but they never coalesce and intermingle as they did formerly. From these statements may be inferred the extreme necessity there is for using a right salve, or one which will keep the poor creature warm and comfortable through winter; and its wool being rendered compact and firm around it, contributes more to this purpose than any other means which can be employed.

Thoughts upon Temperance and Abstinence. By Mr Towers.—When a new theory or doctrine is broached, and has the good

fortune to obtain numerous proselytes, it is, in almost every instance, supported by its followers with a zealous enthusiasm, which "takes the reason prisoner," and attacked by its opposers with a degree of acrimony that equally hoodwinks the judgment. While things remain in this false position, calm and dispassionate investigation is precluded, and an argumentative appeal to fact would be a mere beating of the air.

When temperance societies began to prevail, a gradual but most desirable reform of a pernicious abuse was commenced; but, as is ever the case, an overweening zeal speedily outran discretion; and then entire abstinence, under the silly term of "*tee-totalism*," became the order of the day.

But the fire of proselytism has abated—its violence is quelled; and now we may hope to enter upon a dispassionate, calm inquiry into the merits of the case, with some chance of being listened to without prejudice.

We may be permitted to introduce our remarks by an extract from the *American Almanac* of 1834, which will present a fair view of the objects and probable results of genuine temperance.

1. "The belief that a moderate use of ardent liquor was good for the stomach, the spirits, the blood, and physical strength, had taken, as is well known, strong and deep hold upon the public mind. Everybody knew and admitted that it was wrong and injurious to drink much; but almost every one was satisfied, at the same time, that it was right and wholesome to take a little.

"Now this belief was either correct or incorrect. If correct, the proper course was to drink ardent spirit moderately; and it was the proper business of temperance societies to exert their influence to keep the temperate users temperate, and to bring the intemperate users to the same practice.

"But if the belief in question was grossly incorrect, then the proper course was, not only to call the public attention to the enormous and growing evil of intemperance, but, if possible, to undeceive the public mind concerning the nature and use of ardent spirit; and thus to lay the foundation broad and deep for the ultimate and entire suppression of the use of it *as a common drink*." The four last qualifying words demand remark, because they imply the entire justification of the preceding opinions. The *production* of ardent spirit is the inevitable result of a natural process decreed by the Creator of all things. The vinous fermentation *must* be produced by the operation of the natural leaven existing as one of the components of fruits endowed with a "sweet principle." As such, spirit, or vinous alcohol, is an association of three elements in a peculiar condition, indispensable to man, and therefore *to be used*.

But how used? We have witnessed the wretched results of the ritual indulgence of a glass and glasses of "mixture"—quan

strife, misconception among friends who, five minutes prior
e stimulus of the liquor, had been one in heart and senti-
; yet, in "biding the drinking o' twa cheerers," the mind
udgment became victims of delusion, and the simplest re-
s produced bitter and acrimonious misconception.

. the other hand, we have known a wine-glass of brandy and
ater, mixed in equal proportions, to relieve, in three minutes,
dach, attended with deathlike coldness and universal torpor,
o entirely to revivify the frame, as to make it almost doubt-
ven to the party himself, whether the previous sufferings
een real or imaginary!

e *abuse* of ardent spirits—Hollands, rum, whisky, brandy—
sts in the daily employment of any, or all of them, as a
age. The *use*, which is a positive duty, implies recourse to
as a tried or probable remedy, where a stimulus is decidedly
ited, and *occasionally*, as circumstances may point out, a
eous partaking, with others, of an enjoyment which to reject
l give offence. Danger there is none, unless a peculiar dis-
on of the frame and health prohibit; in which case, no real
l would either urge the act or take offence if refused.
ry creature of God is *good*, and none to be rejected:" the
se is all, and a thankful spirit is the sanctifier.

"Fortunately" (continues the writer) "for the cause of
nity, the truth on this subject was at length not only per-
l but felt; and, through the active labours of the friends of
erance, within the last seven years, vast numbers have been
onvinced that distilled spirit, used as a drink, is not good,
njurious and poisonous; that the use of it is not fitted
e physical constitution or moral condition of the human
r.

.ll sorts of arguments, bearing upon the subject, have been
ht forward to change the public mind; but the most success-
gument has been that derived from personal experience.
(it is asserted,) "*all* that have been in the habit of using
t spirit, whether *moderately* or immoderately, and have
nged the habit for that of entire abstinence from it, have
ed, without a known exception, that they are decidedly
: without it than they were with it."

e above is a paragraph of assertions, and it is followed by
er not less didactic. We quarrel not with the general
believing conscientiously that nine-tenths of the ardent
consumed are abused, at the sacrifice of health, morality,
lomestic comforts. But we ask the writer, or rather those
now assume his opinions, and even go far beyond them,
er the scores of persons from among the thousands of absti-
, who possibly may have *declared* that they are benefited,

can be, in point of truth, pronounced the "*all* without *exception*;" and again, whether they can be strained to represent the tens o thousands who continue to drink and enjoy, and yet live on some, many, to very advanced ages?

The truth is this: When, as is too common, we "run a muck" with that very wretched weapon—a one-sided argument—we sadly overlook the essential dissimilarities of the human constitution. Thus it is in respect to medicine also; for, to such an extent has it been abused by misappreciation, that it should appear as if it would have been well had the discovery never been made. But medicine and spirit are, both of them, the gifts of a bountiful Providence; and with this dilemma we leave tee totalism to contend. Again—

3. "This argument, from personal experience, is plain, practical, and perfectly unanswerable. It can be understood without studying books of anatomy, chemistry, or medicine. It can be brought to the test by every drinker of ardent spirit who will take the pains to try it; and the friends of temperance maintain that the experience of vast numbers who have tried it, and found it perfectly satisfactory, added to the admitted evils of intemperance, lay upon the remaining drinkers of ardent spirit the strongest moral obligation to make the experiment of abstinence and to make it fairly and fully."

Thus far our advocate of temperance appeals to reason, t experience, and to the happy results from the abandonment of a vicious and ruinous practice. We need not cite the evidence of facts derived from the multitudes of reformed persons on land or the adoption of a temperance system "in more than 700 vessels afloat;" for Ireland presents us a more prominent examp —one close at hand.

But the advocates for temperance were not content with th vantage-ground they had obtained by their attack upon the use of ardent spirit as a beverage; they must assail wine, beer and all fermented liquors whatsoever, denouncing them, one an all, as destructive of health, pernicious in the abstract, and subversive of moral good!

This even was so far well, as it applied to the tremendous *abuse* of mercies and comforts which were thus converted int instruments of mischief, to the individual abusers themselves to their families, and to the state of society at large. Yet, deplorable as was the evil, what shall be said of those who, in thei zeal to apply a preventive remedy, have appealed to Scripture It must be notorious to every one who is familiar with the page of sacred history, that *wine* was alluded to at every period o time recorded therein. Other conditions of fermented liquor appear to have been unknown to the scriptural writers.

Wine, otherwise called "the juice of the grape," however, is distinctly named; and if *that* be disqualified by scripture, the argument is at an end—for with it all the products of vinous fermentation must be included.

The more zealous among the apostles of total abstinence, in order to stamp their doctrine with an authority from which there can be no appeal, have not scrupled to assert that the *wine* of the scriptures was the simple unfermented juice of the grape; and, therefore, void of any intoxicating qualities!!

This is rather a startling assertion on the part of those who affect to defer to the "oracles of truth," especially as there does not exist a philosophical reader of scripture or profane history who is not aware that, in the hot oriental climes, the saccharine juice of fruits could not be retained for forty-eight hours without running into the vinous, putrefactive, or acetous fermentation, according to peculiar existing circumstances.

However, the assertion has been made, the doctrine held forth, and stoutly supported; therefore, as we do not intend to meet the subject by arguments, we shall be quite content to cite a few passages of scripture; and, in the form of queries, submit them, according to the bearing of the new doctrine, to the judgment of the candid reader.

GENESIS, ix. 20, 21. Noah planted a vineyard, "and he drank of the *wine*, and was drunken."

PROVERBS, xxxi. 4—"It is not for kings to drink *wine*, nor for princes *strong drink*." 6 and 7—"Give strong drink unto him that is ready to perish," &c.—"Let *him* drink, and forget his poverty."

JOHN'S GOSPEL, ii. The entire history of the marriage feast in Cana of Galilee, and particularly the 10th verse, where pointed allusion is made to quantity as well as quality—"Every man at the beginning doth set forth *good wine;* and when men have well drunk, then that which is worse: but *thou* has kept the good wine until now."

ACTS, ii. 13—"For these are not drunken as ye suppose, seeing it is but the third hour of the day."

LUKE, v. 37-39—"New wine into old bottles," *et seq.*—"No man also, having drunk *old wine*, straightway desireth *new:* for he saith, The *old* is better."

1st TIMOTHY, iii. 3—"Not given to wine"—and v. 23—"Use a little *wine* for thy stomach's sake."

When a man or a sect starts a theory, and appeals to the highest testimony, we have a perfect right, nay, it is a paramount *duty*, to investigate the authority and the manner of its application.

Referring, then, to the few texts above selected, we put the plai question to the reader, whose common sense may be suppose sufficient to discern between truth and fiction—What would b the effect of substituting the *terms* "*raw*, *expressed*, *unferment grape juice*," for that of "*wine*," "new wine," or "old wine?"- for instance, "new *grape juice* into old (leathern or skin) bot tles"—"having drunk old raw *grape juice* straightway desiret *new?*"—"Drink no longer water, but use a little *raw grape jui* for thy stomach's sake."—"*Risum teneatis amice?*"

Verily *we* seek not to distort the oracles of truth; but w ardently desire, in the spirit of meekness, to expose delusion, an thus to vindicate the writings appealed to as of divine authorit

As a crowner, we cite one most pertinent and singular passage it was brought to our notice by a pious member of the Societ of "Friends," who made stout fight against the pretensio of the *teetotalists* upon the ground of scripture authority:- Judges, ix. 12, 13. In Jotham's parable, the *vine* is made to sa —"Should I leave my *wine*, which *cheereth God* and man, an go to be promoted over the trees?" We are not casuists, no do we pretend to be sufficiently enlightened to elucidate th simple or mystical meaning of this text; but, be this as it ma it is pertinent to the object in view. Those who are "wise abo that which is written" may judge for themselves, and get clear the dilemma to which their theory has reduced them.

By the term "*juice of the grape*," our readers must choo between *wine*, as a product of vinous fermentation, or *vinegar*- or, finally, a putrid, offensive liquid, fit for no purpose of domest economy whatsoever. Perhaps the few passages, which ha been selected from among hundreds, may decide the questio and set it at rest.

On Manures. By Mr Towers.—The period we live in is mar ed with novelties. For years, for generations, our farmers i dulged in no changes: they anticipated none; but now ever thing is or ought to be new. Yet, in sober truth, there is n thing really new under the sun. The laws of nature change n her principles are ever the same; the novelty consists in th adaptation.

Thirty or forty new manures are now before the public in t columns of the agricultural journals; yet what *are* they, how we they discovered, and to what purposes of utility can they be a plied? To the last question we reply first, and for this reason. T extension and diffusion of science is the all-in-all—the *sine q non* of agricultural prosperity—and, therefore, we say that t only good which we can discern in the multiplicity of new stim

lists, consists in the proof thereby afforded that science is at work, inquiry abroad, and, as a necessary consequence, that great improvements are on the eve of discovery, whereby, spite of depreciation in price, and competition on the part of foreign states, agricultural productiveness will be so much increased, as to obviate every cause of alarm, and to insure a just and adequate return.

But, in order to approach to an understanding of the agency of manures, we must attain some knowledge of first principles. It has been already stated that the laws of nature change not—man, in all his operations, if successful, has, though unwittingly, been guided by those laws, but herein he acted by mere routine.

The *science* of agriculture implies an investigation of the components of vegetable bodies, and of the constituents of the soil in which they grow. Herein it is that chemistry may be appealed to with the greatest prospect of success, provided that the operator be alive to the paramount influence of the vital principle.

Chemistry can only act upon dead or inert matter: if it approach the principle or agency of life, it at once assumes a false position. Fortunately, however, for the science, in dealing with the products of organization, it can, by means of reagents, determine, almost to atomic precision, the constituents of any matter which it may detect. Thus, for example, a portion of dry and inert potato-haulm is weighed, and its weight accurately registered; it is then burnt with that degree of watchful precision which is perfectly compatible with the refined apparatus of the philosophical laboratory. Its products of every kind are collected, weighed, or measured, and tested. They are found, with few exceptions, to be oxygen, hydrogen, carbonic acid, and sometimes nitrogen gases. These are the volatile or organic products. In the ashes, which remain fixed, are found certain earths and salts, which are now called the inorganic products. Were the living and growing plants investigated, not one of these constituents could be traced; in fact, their existence could only be inferred by reference to the products obtained from analysis of dead vegetables.

But, as nothing can come of nothing, if pearl ash, (*carbonate of potassa*,) soda, chalk, (*carbonate of lime*,) iron, &c., be detected by acid reagents in the ashes of plants, it is manifest that they must have existed in some form or other within the organs of the plant during vegetative life.

It is ascertained that the atmosphere from which plants may inhale some of their constituents contains oxygen and nitrogen, in the proportions of one of the former to four of the latter, and also

some floating carbonic acid and watery vapours; but none of these could produce the alkalis, metals, and earths above named. Therefore it is reasonable to infer that the earth is the source of all the said inorganic substances, of which the water existing in the earth and produced by rain has been the solvent.

But since the juices of the living plant do not exhibit, in general, any traces of those alkalis, earths, or metals, in a state similar to that in which they are found in the ashes, we obtain a degree of evidence that they are combined with some vegetable organic acid in the condition of *salt*, either neutral or super-acid, and such, in fact, can, in certain instances, (as in sorrel, rhubarb, the grape, &c.,) be demonstrably proved to be the fact.

The above are general principles, on which we are able to found particular facts. Thus, then, in conformity with these principles, modern physiologists consider as organic products all the combinations of oxygen, hydrogen, carbon, and nitrogen, laborated and deported in the vascular and cellular systems of plants by the agency of the vital principle; while, on the contrary, those matters derived from the earth, which are metallic, earthy, or saline, they denominate *inorganic*.

The phenomena of growth and cultivation, therefore, depend upon the relative mutual agency exerted between the vitality of plants and the earthy medium in which their roots extend and obtain fluids that can be organized or converted into specific products.

If these views be philosophically correct, the entire theory of manures assumes a certain position; we may not indeed be able to trace the minutiæ, or detect the mysterious agency of causes; but the principles are simple and unerring.

Causes and effects are herein assured; but, at the same time, we are instructed that, unless by rigid investigation we discover the specific components of each plant, the method by which it is cultivated will remain a matter of unscientific routine. Education, philosophical principles, and a practice induced by discovered facts, are thus indicated, and, therefore, imperatively called for.

In the meantime, as we are instructed by general principles that all the organic products of plants contain only the elements of water and of atmospheric air, and as analysis has demonstrated that the manure of a farm-yard, derived from decomposing vegetable and animal refuse, comprises all the essential ingredients of these products we perceive that the manures which we already have at command—provided they can be obtained in sufficient quantity—are available, to all intents and purposes without having recourse to expensive foreign supplies.

Liebig, and several other most eminent chemists, have shewn that loams, which are the products of a variety of rocks broken up by natural processes, contain potass, soda, or both. These alkalis are very soluble in water, and, therefore, may be absorbed by plants, till, at length, a soil shall become exhausted.

Herein we perceive the necessity either of a renewal of the staple loam or the application of some salt, the basis of which is soda or potassa; hence the utility of the nitrate of soda and common salt.

Farm-yard manure, and especially if it be replete with urine, develops abundance of ammonia which passes into the atmosphere. During its progressive decomposition, (commonly termed putrefaction,) a volume of carbonic acid is formed and escapes. These two products demonstrate, 1st, The presence of hydrogen and nitrogen, which constitute *ammonia;* and, 2d, Of carbon and oxygen, which form *carbonic acid*—abundance of watery vapour escapes at the same time; and, finally, the dunghill is reduced to a black mass, which consists chiefly of carbonaceous matter, and becomes a good representative of the substance termed of late *humus.*

Here we perceive all the elements of vegetable matter. The most delicate research fails to detect in wood, fibre, vegetable tissue, gum, rosin, sugar, flour, starch, or other products of organic action, any elementary constituent, except those earthy and metallic substances which are traceable to the earth as their origin.

Earths proper, consist of clay, chalk, sand, and iron, combined with a varying per centage of the alkalis, soda and potassa. Clay or alumina, sand or silex, and oxide of iron, are soluble in water in a very slight degree. Chalk or carbonate of lime is more soluble; and the alkalis perfectly so. Whatever portion, therefore, of any of these inorganic substances is found in vegetable structure, whether simple or in a state of combination, must have been taken up by the roots with the raw sap.

Earths, therefore, undergo little change, but manures vanish. A firm and rich loam is retentive of manure, upon the principle that it encloses and guards it from the decomposing influence of atmospheric air and moisture. Loose sands permit the manure —that major part of it which can be converted to gases—to pass off as such into the atmosphere. Now the decomposition of manure, which must and will take place, rapidly or slowly, in land of any kind, is hastened prodigiously by the action of growing crops, and herein, as is familiarly known, consists the exhaustion of a soil.

The decomposition of manure mainly depends upon the presence of moisture, and, during the process, a certain degree of

heat is created. *Water*, therefore, is decomposed in the first instance, and experiment has proved that, during that phenomenon, a stream of electricity passes, to an extent so vast as to strike one with awe. It is fair, then, to infer that electricity, revealed by the decomposition of water, disturbs all the elements of the manures, and induces them to recombine in the form of ammonia, carbonic acid, and humus.

We have found, in recent publications, frequent allusion to the waste of ammonia during fermentation, and to the propriety of fixing that alkali by sulphuric acid, &c., particularly in tanks containing liquid urinous manure. But while we perfectly coincide with the chemical theory of the fixation of volatile ammonia by an acid, which converts it to a sulphate of muriate, we are by no means anxious on the subject. If the ammonia pass into the atmosphere, we know that its affinity for water and vapour is so strong that it will be thereby retained secure, till it return to the earth in those genial showers (rendered *soft*, perhaps, by the ammonia) which contain all that is required by plants, and in a form far better than we can confer by any of our rude attempts at imitation.

Having endeavoured to shew, by a comparison of the constituent elements of plants, and those of manure and the earths, what are the substances required in general culture, we hope that it will appear evident that our agriculturists ought, as an imperative duty, to economize those refuse substances which are, to a great extent, lost in this very populous country.

In reurging this subject, we are aware that we do but follow in the path of many able writers who have strenuously remonstrated against the waste of those most powerful manures which we do worse than throw away.

Were the night soil of every farm-house received into a bed of good loam, and covered by a stratum of the like earth occasionally, (a very simple mode of erection might be readily adopted to effect the object,) the mass would be made to retain all the fluid as well as solid substances it abounds with. It might, then, from time to time, be transferred to brick or clayed tanks, conveniently situated, wherein it could be protected by a stratum of the loam for some months, till fitted for the fields. Very little waste would then be produced by decomposition.

Liebeg says that the Chinese use no other manure, and hence their fields are comparatively free from weeds. "Indeed, so much value is attached to the influence of human ordure by these people, that the laws of the state forbid that any of them should be thrown away; and reservoirs are made in every house, in which they are collected with the greatest care."

In London, our fine river receives from the sewers volumes of

substances which [illegible] to degrade and poison its stream, but which, if properly applied to the land, would double its productive energy.

Night soil contains all the elements of every plant, and in a state of combination which proclaims it to be superior. Why do we neglect it? Why, on the contrary, do we divert it to the worst of purposes? Were it duly collected, condensed, and applied, our farms would require no foreign appliances, no expensive importations, or spurious attempts at imitation.

Of the theory of manure we say little. Experiments, scientifically conducted, and unintermittingly pursued, are wanting to enable the agriculturist to be sure of any doctrine; yet enough is known to assure us that dead and decaying substances are the appropriate aliment of organic structure, and, therefore, the decomposition of manure is essential to prolificacy. In agriculture we have found no principles, all has been conducted upon routine; hence there is not only great room for improvement, but assurance that with it the productiveness of the land must increase.

We are in no real want of guano, the urates, or other substances bearing attractive titles. So long as compounds of decaying animal and vegetable matter, comprising oxygen, hydrogen, carbon, and nitrogen, can be abundantly obtained from the reservoirs of night soil, and the cleansings of offices and farm-yards, so long may we stand aloof from other appliances.

Let *us husband all our resources*, conduct our drainage, tillage, and rotations upon scientific principles, and nature will do the rest; and, in the meantime, discovery will proceed, and causes be rendered intelligible.

REPORT OF THE STATE OF THE POOR IN FIFESHIRE, AND ON THE MANNER IN WHICH THE LAWS ARE ADMINISTERED IN THE SEVERAL PARISHES OF THE COUNTY, AND ON THE EFFECTS OF THE PRESENT POOR LAWS.

At the General Meeting of the Commissioners of Supply of the county of Fife, held on the 30th April, 1840, there were laid before the meeting,

1. Resolutions of Committee of Association for Inquiry into the Pauperism of Scotland.
2. Resolutions of a Meeting of Noblemen and Gentlemen, held at Edinburgh on the 20th April, 1840.
3. Letter from James Dempster.

The meeting having taken these into their consideration, the motion of the Earl of Leven and Melville, remitted t following committee to consider and report upon the sul viz. :—

The Earl of Leven and Melville,
Mr Heriot,
Mr Cheyne,
Mr Whyte Melville,
Mr Walker,
Mr M. Makgill Crichton.
Three a quorum, and Lord Leven, Convener.

This committee, on the 4th June, 1840, gave in a short re on the subject, which is thus noticed in the minutes :—

"There was laid before the meeting the following repor the committee appointed, on the 30th April last, to consider report upon the several communications made to the co respecting the poor laws, viz. :—'Your committee, having c dered the communications and subject remitted to them, a opinion that the Scottish poor laws have been originally fra with great wisdom, both in relation to the country at large to the wellbeing of the poor themselves, as is clearly pr by the test of centuries, and their great superiority, at the pre day, in regard to principle, over every system known to your mittee. Your committee are of opinion further that we o not rashly to adopt any change in a system which has pr wise and beneficial when duly administered; but, considering the present state of pauperism in Scotland, especially in l towns, requires consideration, your committee recommend measures should be taken, by the commissioners of suppl investigate the state of pauperism within the county, and tendencies and effects of the Scottish system of poor laws the physical and moral condition of the population. Your mittee likewise recommend that a searching two-fold inquiry sh be instituted into the condition of each parish, the first br containing the numerical and financial result—the second br containing the moral statistics of the question. The county in this investigation, be greatly aided by the report prepare a committee of the General Assembly, and presented to Pa ment last year, (1839.) This report does not embrace the moral tistics of the question, but it is understood that the Gen Assembly has this year taken steps to supply this desidera (Signed) Leven and Melville, Convener.' Which report, ha been read and considered by the meeting, they approve the reappoint the committee with the addition of

Mr Monypenny of Pitmilly,
Mr Makgill of Kemback,
Mr Tyndall Bruce,

instructions to them to take all necessary measures for ıing the requisite information, and to report to the Commis-:s of Supply, on or before the 30th of April, 1841."

the 25th of February, 1841, "the meeting (of the Commis-rs of Supply) resolve to grant power to the committee nted to examine into and report upon the working of the ish poor laws, to add to their number, and to appoint sub-ııttees in such parishes or districts where the information is incomplete."

ı the 30th April, 1841, "the clerk produced to the meeting ›ort of the committee appointed in consequence of the esta-ment of an association in Edinburgh for obtaining an official ry into pauperism in Scotland, with remarks by a member of ommittee;' upon which Mr Heriot moved that the commit-ormerly appointed to inquire into the working of the Scot-poor laws, be reappointed and continued, with power to to add to their number, and to appoint sub-committees in ›articular district where additional information is required, here the information sent is not complete; which motion, ; duly seconded, was unanimously agreed to." The meeting remitted the above report to said committee.

. the 30th April, 1842, the meeting reappointed and contin-he committee on the subject of the Scottish poor laws; Mr , being the only additional member, with the same powers as ›rly, Mr Heriot being convener in the absence of Lord n.

e Committee thus named by the Commissioners of Supply, various meetings, with the view of carrying the objects of ›mmissioners into effect, viz., on the 13th May, 1840; 5th ıary, 1841; 7th October, 1841; 13th October, 1842; 5th ıry, 1843; and they reported as follows to the meeting on April, 1843:—"At one of their earliest meetings, your com-e framed a list of queries, in such a manner as appeared to best calculated for obtaining correct information upon the ıs points necessary for the elucidation of the subjects remit-› them; and copies of these queries were transmitted to the men of every parish in the county, with a respectful request they would return the same with such ample information as situation enabled them to give. In several cases your com-e found it necessary, in consequence of the delay or refusal e clergy to return answers to the queries sent, to apply to parties connected with a few of the parishes to obtain the nation wanted.

The following is the list of parishes :—

1. In the presbytery of Dunfermline, ...
   Note.—Cleish, Kinross, and Orwell, are in the county of Kinross, and Culross is situated in the county of Perth, although in this presbytery; therefore not included in the report.
2. Presbytery of Kirkaldy, ...
   Note.—No return has been made by the minister of Markinch in this presbytery.
3. Presbytery of Cupar, ...
4. Presbytery of St Andrew's, ...
   Part of Arngask is in Fifeshire, although in Perth presbytery, ...
   Part of Abernethy is in Fifeshire, although also in Perth presbytery, ...

Total parishes situated wholly or partially in Fife,
No returns from Markinch or Abernethy, . . .

Total number of returns obtained, ...

Your committee ought, perhaps, to apologize for being in making any report regarding the state of the poor; bı found it no easy matter to get the returns of all the pε With regard to some of them, they had to apply to mem their committee to get it undertaken by competent indivi and, with the exception of the parish of Markinch, in the tery of Kirkaldy, a large, populous, and somewhat difficult in consequence of there being several *quoad sacra* churche they have now the satisfaction of being able to state th have received returns from every parish in the county, th is much to be regretted that several of them are, in respects, very incomplete.

Since this committee was first appointed, a commissi issued from the Crown to seven individuals to make a co report regarding the poor of the whole of Scotland, an committee therefore think it would be improper to ente the subject at great length. Their intention, therefore make their report as brief as possible, consistent with cle referring to the returns themselves for a further elucida the subject. Your committee shall consider the subject three principal divisions :—

1*st*, *The Present Condition of Paupers and of the Work Classes.*

The committee issued twenty-two questions upon this su

though they think that many of the answers are not so
and distinct as they would have wished, yet they, along
he tables, contain a considerable amount of facts bearing
subject.

s. 1.—What is the total amount of population in your
—about what proportion of that number are of the working
—and what is the number of paupers?

s. 2.—Is the population of your parish chiefly agricultural
nufacturing?

s. 3.—What are the allowances or average wages of ser-
hired for farming work by the year?

.—It appears that the yearly wages of farm servants with-
county run from £8 to £13 in money, six and a-half
of oatmeal, a pint of sweet milk daily, or one shilling per
in lieu thereof, with about twenty-four falls of potato
d, (or six bolls of potatoes,) and a free house and garden,
heir coals driven; varying, probably, from £16 or £18 to
er annum.

unmarried men receive nearly the same wages, according
ir ability, but have not the house and garden, (they living
othy,) nor the potato ground.

females employed in agricultural labour, it appears, receive
£5 or £6 per annum; with their victuals, from £4 to
0s.

s. 4.—What are the average wages of able-bodied agricul-
lay-labourers?

.—The wages of agricultural day-labourers vary from 1s.
4d. in winter, and from 1s. 4d. to 1s. 9d. in summer.
g harvest they receive from 2s. to 2s. 6d. per day, besides
ls.

women employed in the fields receive from 8d. to 9d. per
r, as stated in some of the answers, 1d. per hour. During
t they receive from 1s. 8d. to 2s. per day, (with victuals.)

s. 5.—What are the average wages of the other work-
asses?

.—The weekly wages of mechanics or artisans vary ac-
g to their various employments. In the Dunfermline
, the answer is, "About 10s. 6d. per week is the ave-
f weavers; 7s. 6d. journeymen weavers; masons, 12s.;
, 13s.; smiths, 14s.; and mill-factors, or superintendents
ners of flax, 13s.; also flaxdressers, 16s."

ther parts of the county, they are reported rather lower:
St Andrew's, masons and wrights about 2s. per day;
rs, 4s. to 5s. per week; the other classes, from 10s. to 12s.
ek, (Crail parish;) females, 8d. per day.

s. 6.—What is usually paid by labourers for house-rent in
arish?

Ans.—The house-rents of the working-classes vary from 30s to £2 : 10s. per annum; the weavers' houses about £3 : 10s.- generally from £2 to £5 per annum, (Kirkaldy)—the weavers houses being large, and containing loom-stances.

Ques. 7.—What has been the average price of meal, of potatoes and of coals or other fuel, in your parish, during the last te years?

Ans.—The average price of meal, during the last ten year appears to have been from 17s. 6d. to 19s. for the boll of oa meal of 140 lb, or about 1s. 1d. to 1s. 2½d. the old peck, 10¼d. to 10½d. the small peck of 7 lb avoirdupois. The averag price of potatoes, during the said space of time, is reported t have been about 1s. 6d. to 1s. 8d. per cwt. The price of coa varies considerably in different places, in consequence of the great or less distance from the coal-pits, and the increased expense carriage. Thus, at Dunfermline, in a coal neighbourhood, th whole cost of coals is 6s. per ton; while, at Monimail, at a di tance from the coal-pits, the coals cost 15s. per ton; and Kettle, an intermediate distance, the cost is 13s. 4d. per to The sea-towns' coal, at the different places near the coast, 36s. 8d. per ton, (or the boll of 3 cwt. costs 5s. 6d.—Balmerino this being English coal, including cartage.

Ques. 8.—On what articles of food do the labouring class in your parish principally subsist?

Ans.—The articles of food used by the working classes a oatmeal, potatoes, fish, pork, occasionally wheaten bread, butte tea, and coffee.

Ques. 9.—What are the weekly wages of the lowest class labourers or artisans in your parish who have no parochial relie

Ans.—The rates of wages of the lowest class of laboure are reported to be from 8d. to 1s. per day, or from 4s. to 7 per week.

Ques. 10.—Are there, or have there been, within the last te years, any able-bodied persons in your parish willing to work but unable to procure work; and has there been any gener subscription for their relief—and if so, how often and to wha amount?

Ans.—In general, there is reported, until lately, to have bee few persons unable to obtain work who desired it, except da labourers during storms of snow and frost in winter.

Ques. 11.—If there have been any able-bodied persons in you parish, belonging to the working classes, unable for a season t work or procure work, and who yet obtained no parochial relie state how they subsisted during that period.

Ans.—During such periods of want of work, they are sai to have been supported upon their former savings, by the assis ance of friends and neighbours, by public subscriptions, *and in*

no parishes by occasional sums granted from the poor's-fund, Inverkeithing, Dysart, Moonzie, St Andrew's, Elie.)

Ques. 12.—What is the actual condition, in respect of household comforts, clothing, food, education of children, and otherwise, of the working-classes in your parish; and has the standard of comfort in this respect risen or fallen within your recollection?

Ans.—There appears considerable difference of opinion regarding the household comforts, &c., of the working-classes. Out of 61 parishes from which we have returns, 27 report that the standard of comfort has risen, while 6 report that there is little or no variation—7 that the people are comfortable—3 that they have been retrograding for these three last years—while 9 are of opinion that the comforts of the working-classes have fallen within the last ten years—and the remainder have not answered the question.

Ques. 13.—What is the number of paupers in your parish, if any, who subsist entirely on the parochial allowance, without aid either from their own or other resources.

Ques. 14.—In regard to those paupers whose only means of subsistence are derived from the parish, is the parochial allowance enough to afford them a sufficient maintenance?

Ans.—The accompanying table will shew the number of poor in the respective parishes. Some of the returns are, however, defective in this respect. In very few cases are the allowances given to the poor sufficient to support them without aid from other sources, either from their own labour or the benevolence of relations and neighbours; the only exception to this is a few cases of persons bed-rid and lunatics. When they have absolutely no other allowance of any kind, the allowances by the kirk-sessions are extremely scanty.

Ques. 15. Are there any, and how many, persons in your parish, who subsist either partially or entirely by begging, or other eleemosynary aid, and who have acquired a settlement in your parish?

Ans.—There is little or no begging by the paupers in their respective parishes, although this is the only begging permitted by our law.

Ques. 16.—Do either the paupers or the working-classes in your parish suffer much from infectious fevers or other serious diseases?

Ans.—There appears to be few cases of fever or infectious diseases within the various parishes in the county—there is some exception to this in the large towns. In Dunfermline, "within the nine last months, (in 1841,) paupers, and the lowest class of labourers have suffered considerably from fever." In the parish of Wemyss, the working-classes suffered much from fever and other diseases, two years ago, (1840.) In Cupar, "within the four last years, we have been severely visited with typhus fever,

scarlet fever, and small-pox, all of which chiefly affected working-classes."

In Cellardyke, (Kilrenny,) "where the population is de crowded, fever very generally prevails." And in the paris Largo, it is said to prevail in the villages.

Ques. 17.—Are the dwellings occupied by the working an poorer classes in your parish generally neat and cleanly, o reverse?

Ans.—With regard to the state of the dwellings of working-classes, they are represented as neat and clean, w few exceptions in some of the parishes. In Scoonie, the an is, "I cannot say they are either neat or cleanly." In C "there is considerable variety—many are neat and clean weaving-shops, generally speaking, ill-aired and damp." Andrew's, "generally neat and clean, with the exception o houses of the fishers."

Ques. 18.—How many public-houses, or houses having lic for the sale of spirits, are there in your parish?

Ans.—With regard to the number of licensed public-h within the county, the committee have got a return of the wh this date, (March 27, 1843.) They are in the following numbe

1.	District of Cupar,	86
2.	... St Andrew's,	131
3.	... Kirkaldy,	211
4.	... Dunfermline,	119
		547

BURGHS.

Cupar District	Auchtermuchty,	20	
	Cupar,	48	
	Falkland,	8	
	Newburgh,	27	
St Andrew's District	Anstruther, Easter,	20	
	Anstruther, Wester,	3	
	Crail,	10	
	Earlsferry,	4	
	Pittenweem,	24	
	St Andrew's,	44	
Kir[illegible]	Burntisland,	18	
	Dysart,	21	
	Kinghorn,	10	
	Kirkaldy,	60	
	Dunfermline,	85	
	[illegible]keithing,	28	
			430
	Total number,		977

cases in th ward parts of the county are granted stices of P for the county; the licenses within the the Magistrates.

9.—In cases of families being brought to sudden destid helplessness by the death of parents or other casualie sessional allowance was insufficient, how were they d?

The families which are rendered destitute by any lamity, are aided from the occasional fund—*i. e.* the m from one-half of the church collections, employed for of the occasional poor, assisted by relatives, friends, or s, and are never left to starve for want of aid, which, in s, is forced upon them, if, through modesty, they should ard in applying for relief.

0.—In such cases, do neighbours and relations do much ther?

The paupers are generally aided by their relations bours, who generally do something; some of them a l, while others are said to hang back.

1.—Do many of your able-bodied labourers leave their the sake of better wages in other places, as in the great

A few able-bodied labourers and others leave the seek work when it is not to be had at home, *but not* and have gone to the railways to obtain it. Colliers a greater extent than other labourers.

2.—Are there any English or Irish on the poor's-roll?

There appear to be extremely few English or Irish n the poor's-rolls in the county—they may be speci-

ishwoman in Dalgety, *twelve Irish* at Dunfermline, *one an* at Leslie, *an American woman* at Criech, *two Irish two children* of an *Irishman* at Denbog, *one Irishwoman* asional list at St Andrew's, one *Englishman*, (a lunatic,) —or twenty-one strangers in all.

Mode in which the Poor Laws are Administered.

.—Is medical assistance ever given as part of the parish our parish?

Medical assistance is very rarely *or never paid for* he poor's-funds; the medical practitioners generally the poor gratuitously, some allowance being generally m for the medicines afforded.

.—Are able-bodied labourers relieved on account of sickness, and if so, how?

Ans.—The able-bodied labourers, when unable to work from occasional illness, are, (when not members of a friendly society, from which they obtain money,) relieved from occasional funds placed at the disposal of the kirk-session, for which purpose one-half of the church collections are, by law, placed at their disposal.

Ques. 3.—Are there any paupers supported by your parish who have parents or children, or other relatives, bound and able to support them, at least to some extent, and who do so? If so, state how many such paupers there are.

Ans.—The poor are assisted by the kirk-sessions, even although they may have relations able to support them; but, in most cases, they obtain assistance from such relations.

Ques. 4.—Are any means taken, before the general meetings of heritors or kirk-session, at which paupers are admitted to the roll, to ascertain those parties who require parochial relief either on their own application or otherwise?

Ques. 5.—Is there any periodical investigation of the above points in regard to paupers already on the roll, either at the general meetings of heritors or kirk-session, or previously? If so, state the nature and extent of such periodical inquiry, and by whom it is made.

Ans.—No person is admitted to the roll without full and correct information as to their cases and necessities; and, even when admitted, the aid given is increased or diminished as their necessities require, and this may be done either by periodical inquiries into the state of the poor's-roll, or, more frequently, from the accurate knowledge of the members of kirk-sessions of every person in the parish, and more particularly of every person on the poor's-roll.

Ques. 6.—Do the heritors require an assignation to whatever property may belong to paupers before they are admitted upon the roll?

Ans.—In general it is not usual to take assignations to the property of the pauper when he dies, the property is taken and sold if the expense of the funeral is claimed from the kirk-session, otherwise the relations are allowed to take it.

Ques. 7.—Are there any, and what, means taken to ensure a proper application and disposal of your parochial allowances?

Ans.—Every care is also taken that the allowances given are not misapplied—the smallness of the allowances is in most cases a guarantee on this subject—where the paupers are inclined to do this, the payments are made more frequently, or even given in kind, where necessary, so that, from the intimate acquaintance with every case, no misapplication can take place without [illegible]

s. 8.—What was the number of poor on the ordinary poor's-ı 1st January, 1838, (exclusive of lunatics?)

s. 9.—What was the number on said roll, on 1st January, (excepting lunatics?)

s. 10.—What the number on ditto, on 1st January, 1840, ›ting lunatics?)

s. 11.—What the number on 1st January, 1841, (excepting ›s?)

s. 12.—What was the number of lunatic poor on the 1st ry, 1838–39–40–41 respectively?

s. 13.—What was the total expense of the ordinary poor r parish, for the years 1838–39–40 respectively?

s. 14.—What is the number of ordinary poor on the roll sent, (*i. e.* the date of the returns—exclusive of lunatics?) is the present number of lunatic poor?

s. 15.—What was the number of occasional poor (not on rdinary poor's-roll) relieved by you in 1838–39–40 respect-

s. 16.—What was the amount of sums paid to the occa- poor in 1838–39–40 respectively?

s. 17.—What is the amount of your allowances to the poor ordinary roll?

s. 18.—What does each of these lunatic poor cost the ? Are any of them boarded in lunatic asylums, and in ?

.—The table appended to this report shews the number of a more satisfactory way, where the answers enable it to de up, which the reporters are sorry to say is not always se, and whatever other particulars can be exhibited in a r form.

expense of the lunatic poor differs, in consequence of their in a lunatic asylum, or kept by their friends at home. The se of a lunatic in a regular asylum, exclusive of clothing, e taken at £20 or guineas per annum, (the clothes cost £4 more.) The parish of St Andrew's having acquired a o the nomination of three pauper lunatics to the Edinburgh Asylum, expect to have them maintained at considerably ıbout £15 per annum each, besides clothes.) No other in the county seems to have formed any such connection lunatic asylum. The lunatics kept by their friends are to cost the parishes £9 or £10 per annum.

s. 19.—What number of poor children are educated from or's-funds?

s. 20.—What number of poor children are taught *gratis* by rochial schoolmaster?

.—With regard to the education of the children of

the poor, there are Dr Bell's college at St Andrew's and school at Cupar; at the former of which, 130 are educated gratis, and nearly 200 more at 1s. per quarter; and at the latter of which, a number of children are educated at a low rate. There are also other two schools, one at Pathhead, (parish of Dysart,) and the other in the parish of Kinghorn, at each of which 50 poor children are clothed and educated on Mr Philip's mortification. Except these, there is no fund for education in the county. The kirk-sessions and heritors generally take the parochial schoolmaster bound to educate a certain number of poor children gratuitously. Sometimes the kirk-sessions pay half-fees, and the parochial schoolmasters of some parishes educate many more gratuitously. In general, it may be said that there is no want of education for the children of the paupers, and that their education is nearly on a level with that of the children of the working-classes, excepting that they may be sooner sent out to act as herds, and, of course, are forced sooner to leave school.

Ques. 21.—What was the amount of the collections for the poor at the church doors for the years 1838-39-40 respectively?

Ques. 22.—What was the amount of voluntary assessment for the poor for the years 1838-39-40 respectively?

Ans.—The amount of the church collections and voluntary contributions will appear from the table. In few of the parishes are the church collections now sufficient wholly to support the poor, which, therefore, must be supplied from voluntary contributions, (now very general,) or from legal assessment in one or two parishes.

Ques. 23.—What was the amount of legal assessment for the years 1838–39–40 respectively?

Ans.—The only parishes in which there was any legal assessment, at the time of these returns, were Dunfermline and Inverkeithing. Since that time, a legal assessment has been made in the parish of Kettle, and several of the adjacent parishes are now threatened with it.

Ques. 24.—What is the amount of the separate funds at the disposal of the kirk-session—the nature thereof, and from whom derived—and what are the dates of the legacies or other bequests to the kirk-session for behoof of the poor of the parish?

Ans.—The average amount of the funds will appear from the table and the items of which it is composed. In the greater number of parishes voluntary contributions are made by the heritors.

Ques. 25.—What is the number of persons who take charge of the poor?

Ans.—I[illegible] parish[illegible] charge of the poor is taken

by the kirk-sessions, which are made up of the minister and elders of the parish. Where these have been regularly kept up, the poor have been well and cheaply taken care of. In some parishes, where there are no elders, the minister, assisted by the factors or managers for the heritors, have taken the charge. In those parishes where a legal assessment has been imposed, managers have been appointed who have come in place of the kirk-sessions. In Dunfermline they have a manager and sixty members, who form the poor's-board. In Inverkeithing, the provost, the schoolmaster, and eight tenants constitute the board. In Kettle there are at present twelve members who form the board, (the elders having given up attending the meetings.)

Ques. 26.—What is the expense incurred in collecting and distributing the sums to the poor?

Ans.—The expense of collecting and distributing the funds, in all cases under the old system, is very small, being generally a small annual payment of £5, or £5 : 5s. to the heritors' clerk. In other cases, where there are regular voluntary contributions, a small per centage (in many cases 2½ per cent.) is allowed for the collection, and nothing for the distribution. In Dunfermline, the manager is allowed a yearly salary of £70. In Inverkeithing the whole expense of collection is only £5 : 5s.

Ques. 27.—When a number of persons are thrown out of employment, how are they relieved?

Ques. 28.—What is the usual age at which old persons are considered admissible to the roll of the ordinary poor?

Ans.—There is no fixed age for receiving persons on the roll; if they are unable to work from infirmity, blindness, or other cause, they receive any assistance which may be necessary. Some report the general age to be from sixty to seventy.

Ques. 30.—How often are the allowances paid to the poor?

Ques. 31.—State the names, the former professions, the ages, places of birth, places of residence, (if out of the parish,) and other particulars regarding paupers at present on the ordinary roll; also the sums paid to each of them; also the same particulars regarding the lunatic poor, by filling up the annexed table—stating particularly the causes, or supposed causes, which have led them to apply for parochial relief. It may be proper, too, to mention whether they have any near relatives who give, or are able to give, anything for relief of their wants.

Ans.—With regard to the sums paid to each individual pauper, or the general rate of payment to each, reference must, of course, be made to the table; but, as an example, the parish of Dunfermline may be given, not only on account of the total number (410) being much greater than the paupers of any other parish, but as affording every gradation. The allowances are—

"2s. 6d., 3s., 3s. 6d., 4s., 5s., 6s., 7s., 8s., 9s., 10s., 11s., 12s., 14s., 16s., 20s., and 24s. per month respectively." They d their poor into classes as follows:—

1. *Class.*—Diseased or imbecile paupers requiring much a tion, and living with strangers, (per month,) 12s.
2. Diseased or imbecile paupers requiring much attention, l with relations liable for their support, but unable wi aid, 8s.
3. Aged paupers totally dependent, and requiring partial at ance, 10s.
4. Aged paupers able to gain a partial livelihood, or h relatives liable to aliment them, but unable without ai
5. Each child dependent on, and residing with, individuals i of the foregoing classes: For the first child, 3s.—for additional child, 2s.
6. Each child boarded with strangers: For the first, 8s. each additional child, 6s.
7. Children boarded with strangers willing, though not bou contribute to their maintenance, or liable to do so, bu able without aid: For the first, 5s.—for each addi child, 4s.
8. Individuals requiring limited aid, 2s. 6d.

3*d*, *The Effects of the Existing Poor Laws.*

Ques. 1.—Have there been any cases in your parish, withi last ten years, of applications to the sheriff by persons to co the heritors to take their cases into consideration, or to ge to award an allowance to them from the poor's-funds?

Ans.—It does not appear that it is usual to refuse a ance to the aged, infirm, and those who are unable to work have a legal claim on the parishes. A few cases of applic to the sheriff have taken place, but they have failed in sh that they are entitled to be put on the roll. The numb these is seven within the last ten years, spread over the parishes of Fife.

Ques. 2.—Have there been, within the last ten years, any pe in your parish, having a legal claim on it, who, in conseque the heritors neglecting or refusing relief, have gone elsewhe seek a settlement, or charitable support?

Ques. 3.—Are there any cases, within the last ten yea persons resorting to your parish from other parts of the cou with the view of endeavouring to acquire a settlement in it of coming on your poor's-roll?

Ans.—It does not appear that many cases have occurr persons endeavouring to obtain a settlement in a parish to v

they do not originally belong. No doubt such rights have been obtained by farm-servants and others becoming unfit for hard country work, when they have been compelled to resort to the towns and villages for a place of residence, but this arose from the circumstance of the houses on the farms being only sufficient in number for the farm-servants and labourers, and the parties being thereby compelled to go to the towns and villages, and from no view of acquiring a new settlement.

Ques. 4.—Are there, or have there been, within the last ten years, in your parish, any cases of husbands, wives, parents, or children, deserting and abandoning each other respectively, in order that the parish might be forced to give a maintenance?

Ans.—It appears that there have been instances of husbands deserting their wives and children, but these are few in number, and still fewer of them occasioned by the poor laws.

Ques. 5.—If there be any mortifications, or other bequests for the relief of indigence in your parish, has the amount of indigence in the parish been thereby increased, or in any way affected; and if so, in what way, and to what extent?

Ans.—The mortifications in Fifeshire are few in number and small in value, and do not appear to have any effect in increasing pauperism, or in any degree affecting it.

Ques. 6.—If in your parish, as in some others, the permanent poor are supported out of the church collections, is there a greater unwillingness on the part of the poor to accept of aid from this source than from the fund raised by assessment, or voluntary contributions?

Ans.—There is some difference of opinion whether there is more willingness in the poor accepting aid from the voluntary (or legal) assessment, or from the collections at the church doors, but the general opinion is, that there is no difference, and some who are of a different opinion think that this feeling has nearly passed away.

Ques. 7.—Are there any cases in your parish where you believe that the relatives of an applicant for parochial relief held back in time of sickness or old age, or other cause of destitution, on account of the expectation of parochial aid?

Ans.—The opinion is, that, in general, there is no holding back by the relatives in assisting their parents, &c., on account of the relief afforded by the kirk-session, although a few cases to the contrary are noticed.

Ques. 8.—If there has been any increase or diminution of paupers in your parish, within the last ten years, state the cause of this.

Ans.—The opinion is, that there has been little increase in the number of paupers within the last ten years, farther than is

warranted by the increase of population, and such increase has taken place among the manufacturing population. In the parish of Kinglassie, they seem to have nearly doubled since 1830, which the minister ascribes to the *increased rent* of the farm belonging to the kirk-session.

Ques. 9.—Have the working-classes in your parish been encouraged to appropriate part of their earnings to such institutions as savings banks, friendly and benefit societies, insurance companies; and have they of late years shewn themselves more disposed than formerly to avail themselves of such institutions?

Ans.—With regard to savings banks, benefit and friendly societies, the former has decidedly advanced, both in the amount of deposits and the number of depositors, while the friendly and benefit societies have very much decreased in number, the cause of which is easily explained. After the principles on which these societies ought to be formed were ascertained, under the auspices of the Highland and Agricultural Society, and the attention of Government was drawn to it, it was found that nearly the whole of the benefit societies were formed upon erroneous principles—that the sums paid in by the members were too small to afford the benefits held out, and that, of course, every such society must finally become bankrupt—the consequence has been that nearly the whole of these societies have been broken up, and the funds in hand divided among the members and the widows on the list. A few remain, and these have been remodelled, approved of by the quarter-sessions under the acts of Parliament, and are now going on; but these are few compared to the former number: and we accordingly find, in many of the answers to the ninth question, many complaints on this subject.

The answers with regard to the amount of private charity distributed by individuals, do not state that this is of great amount. A few female associations in some of the towns are spoken of, and in some parishes a considerable amount is distributed by private individuals, for which the reporters beg leave to refer to the answers themselves.

Upon the whole, and after considering the answers which have been returned to the whole questions, and the whole subject, the committee are of opinion—

1. That, in so far as the county of Fife is concerned, and the parishes thereof, the present poor laws work well, and are productive of great benefit and advantage to the poor coming within their operation.

2. That where there are regular kirk-sessions (and, perhaps, in some other parishes where they have been worked by the

without the assistance of elders) they have been effectual
ıg the funds do much in promoting the comforts of the

at the committee are of opinion that the sums paid to
' are too small, and ought to be increased, particularly
ase of single women, many of whom can have very little
:raneous sources, when their work within doors, by which
lividuals have been in use to support themselves, is taken
ıd where obtained they are but poorly paid.

nembers of the kirk-sessions having no pecuniary interest
ing a body independent of the heritors (where in suffi-
ımbers) can sift every case, and, while they prevent any
ion by the poor, can afford the required relief; but very
ıey are too few in number.
ıneral, the poor law of Scotland only gives support to the
he very young, and those who are unable to work. No
ıs hitherto been afforded to the able-bodied, or persons
work, although they are unable to obtain work. In the
es of this nature which have occurred in Fife, relief has,
y instances, been given from the occasional fund. The
rs are not called upon to speak on this question, which is
tended with much difficulty, and which has occurred to
ı extent lately in Paisley, Greenock, and the towns in
st of Scotland.
r committee being generally called upon to report as to
rking of the poor laws in the various parishes within the
of Fife, are scarcely authorized to point out the mode of
ing the present evils arising from the alterations caused
present state of society. That they have continued to
o well after a period of upwards of two centuries is more
ing than that some evils have arisen; and had the old
ial Presbyterian system been fully maintained, even many
se inconveniences would have been avoided. They may
ıre close this report with expressing an opinion that, what-
terations are made on the system, they ought to be made
ıuch care and caution, if they are intended to confer a
upon the poor of this country, whose welfare is the great
which the parties making such alterations or improvements
to keep in view.

ed, in name and by appointment of the committee, by

JAMES HERIOT, *Convener*.

SYNOD OF FIFE.—*Presbytery of Cupar.*

PARISHES.	Population.	Average Number of Ordinary Poor.	Average Annual Expense of the Poor.	Average Payments to Occasional Poor.	Number of Lunatics.	Average Expense of Lunatic Poor.	Average of Church Collections.	Average of Mortcloth and Marriage Fees.	Average of Mortifications.	Average of Voluntary Assessments.	Miscellaneous.
			L. s. d.	L. s. d.		L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
Abdie, - - -	1507	4	15 3 4	0 2 6	4	31 10 0	18 4 8	1 11 5½	21 6 8	16 13 4	- - -
Auchtermuchty,	3352	56⅓	211 7 8	31 11 8	3	35 0 0	28 0 10	3 6 0	- - -	30 0 0	- - -
Balmerino, -	993	11⅔	26 16 0	12 8 2	3	12 0 0	22 15 1	0 13 8	- - -	16 9 7½	- - -
Ceres, - - -	2950	48⅓	140 12 3½	17 19 7	10	54 4 10½	52 18 1¾	7 18 6½	10 15 10	153 0 4½	15 0 0
Collessie, - -	1162	10	44 1 0	5 12 $5\frac{4}{12}$	1	18 5 0	43 19 0½	1 0 6	- - -	12 7 8^{12}	- - -
Criech, - - -	438	4	13 18 5½	8 10 7	1	5 0 0	11 7 9½	1 0 4	- - -	- - -	27 1 3¼
Cults, - - -	888	10⅓	47 4 7½	3 9 8	-	- - -	10 6 3½	0 15 6	- - -	39 5 10½	15 4 11
Cupar, - - -	6735	120	219 8 2½	85 18 0	2	- - -	158 17 6½	- - -	- - -	226 13 4	- - -
Dairsie, - -	669	10⅔	30 17 7	- - -	-	- - -	15 19 $6\frac{8}{12}$	2 2 4	0 17 0	- - -	- - -
Denbog, - -	200	9⅓	37 4 5¼	- - -	-	- - -	14 4 9½	0 8 6	- - -	23 5 11^{8}	0 6 3
Falkland, - -	2880	23	59 16 0	- - -	2	24 0 0	20 0 0	3 7 4	8 0 0	29 1 1	34 0 0
Flisk, - - -	286	5	14 7 1	- - -	-	- - -	5 10 $0\frac{9}{12}$	0 12 8^{6}	- - -	16 6 0^{6}	2 18 1
Kettle, - - -	2274	34	138 4 1	8 10 5½	-	31 2 8½	15 1 9½	- - -	- - -	157 15 10^{6}	- - -
Kilmany, - -	670	12⅓	26 9 3	7 16 10	-	- - -	10 15 $5\frac{4}{12}$	2 11 10	- - -	20 0 0	- - -
Logie, - - -	430	8⅓	34 13 4	2 0 0	1	3 0 0	8 6 8	- - -	1 5 0	30 0 0	- - -
Monimail, - -	1200	12⅔	47 10 0	12 12 7	1⅓	12 0 3½	51 4 1	0 15 0	2 2 10	25 14 3^{4}	3 0 0
Moonzie, - -	188	4⅓	15 14 0	2 1 3	-	- - -	2 8 11	1 1 4	36 9 0	- - -	- - -
Newburgh, -	2868	22	48 11 10	23 7 4	-	19 14 10	66 6 0	6 2 6^{6}	12 7 10^{9}	- - -	4 7 1
Strathmiglo, -	2000	12⅔	51 10 6	- - -	2	39 0 0	21 3 9	3 7 5	- - -	- - -	- - -
Total, -	31,682	419*	1223 9 9	222 1 1	30⅓	284 17 8	577 10 5	36 15 0			

* This shews that the number of paupers on the rolls of the several parishes amounts to about 1⅓ per cent. of the whole population. This, however, is not equally distributed. While some have upwards of two per cent., others have less than one per cent. The parish of Abdie has, perhaps, the smallest number in proportion to its population, and Denbog, perhaps, the largest: and yet both parishes are almost wholly agricultural. From what can this great discrepancy arise?

It appears from the above that the average allowance to paupers on the roll amounts to £2 : 18 : 4^{9} to each annually, or 1s. 1^{6}d. weekly.

Parishes.	...tion.	Average number of ordinary P...	Expense of the Poor.	Payments to Occasional Poor.	Numb. Luna...	... Lunatic Poor.	Church Collections.	... and Marriage Fees.	...tions.	... Assessments.	
			L. s. d.	L. s. d.		L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
Abercrombie, -	1157	22	---	---	1	25 16 0	8 14 1½	---	21 12 0	75 1 3⅓	---
St Andrew's, -	6033	102	388 17 3½	49 13 0	7⅓	73 3 7	278 18 6	5 2 9	132 5 6	79 16 8	19 18 1
St Leonard's -	554	17	85 3 10⅓	---	-	---	45 3 10	---	9 0 9	22 18 0	1 18 0
Anstruther, East,	1014	-	---	---	-	---	47 4 7	---	---	---	---
Anstruther, West,	449	8⅓	37 19 5	---	-	---	6 17 4½	0 2 0	---	3 1 0	61 4 6⅓
Cameron, - -	1167	13	39 4 6½	43 8 11	-	---	17 19 6⅔	1 18 0	---	36 13 4	---
Carnbee, - -	1043	14⅓	43 8 11⅔	---	-	---	17 17 2½	1 19 8	12 16 0	35 0 0	---
Crail, - - -	1884	-	---	---	-	---	---	---	---	---	---
Denino, - - -	471	6	20 4 8	---	-	---	2 6 10½	1 10 10	---	---	4 11 9
Elie, - - - -	907	15	46 7 2	9 6 8	2	---	34 10 8	1 0 4	---	---	74 10 0
Ferry-port-on-Craig - - -	1741	16⅔	82 8 0²	3 5 10⅔	1	---	52 0 0½	3 7 6	---	47 13 10½	---
Forgan, - - -	1219	5⅓	9 16 10	47 8 1⅓	2⅓	44 8 1²	30 1 8²	6 0 8	4 0 0	---	---
Kemback, - -	780	15⅓	32 15 9	88 14 6	-	---	18 16 0¹⁰	---	---	11 9 1⅓	10 0 0
Kilconquhar, -	2605	35	---	---	4	59 15 4	54 4 2	4 7 0	---	98 6 8	38 0 0
Kilrenny, - -	2039	10⅔	80 0 0	16 0 0	2	25 0 0	25 0 0	---	---	43 6 8	---
Kingsbarns, -	968	12	41 4 1	9 1 4⅔	-	---	38 18 3⅓	3 7 6⅔	20 0 0	33 9 4⅔	5 2 9
Largo, - - -	2751	41⅓	146 6 11⅓	6 0 0	3⅔	64 6 9	34 8 4⅓	1 10 4	67 19 7	187 13 4	---
Leuchars, - -	1897	33⅓	127 13 4	---	2	---	35 6 8	---	32 0 0	53 6 8	10 0 0
Newburn, - -	419	7⅔	35 18 8	2 8 8	-	---	13 16 6⅓	2 5 10	---	---	---
Pittenweem, -	1349	-	---	---	2	---	---	---	---	---	---
Total, -	30,447	375*									

* This shews that the number of paupers on the rolls of the several parishes amount to about 1¼ per cent. of the whole population—not, however, equally distributed.

The average allowance to paupers cannot be ascertained, as several returns are incomplete. But the annual allowance to the St Andrew's paupers appears to be at least £3 : 16s. each—consequently their weekly allowance averages about 1s. 5½d. But the allowances in several parishes is considerably higher. In the parish of Kilrenny, for instance, the average amounts to very nearly £8 per annum each—or to very nearly 3s. 1d. to each weekly—while others do not exceed the half of these amounts.

SYNOD OF FIFE.—*Presbytery of Kirkaldy.*

PARISHES.	Population.	Average Number of Ordinary Poor.	Average Annual Expense of the Poor.	Average Payments to Occasional Poor.	Number of Lunatics.	Average Expense of Lunatic Poor.	Average of Church Collections.	Average of Mortcloth and Marriage Fees.	Average of Mortifications.	Average of Voluntary Assessments.	Miscellaneous.
			L. s. d.	L. s. d.		L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.	L. s. d.
Abbotshall, -	3914	59	140 11 $9\frac{1}{3}$	- - -	3	- - -	63 3 $0\frac{1}{2}$	- - -	- - -	185 19 8	24 9 $6\frac{3}{4}$
Auchterderran,	1913	27	75 12 10	8 12 3	-	- - -	19 11 0	0 10 $3\frac{1}{2}$	24 11 3	47 5 10	5 5 0
Auchtertool, -	530	$7\frac{1}{3}$	14 17 0	0 18 2	-	- - -	14 8 $8\frac{2}{12}$	2 2 8	- - -	- - -	4 5 0
Ballingry, - -	436	$8\frac{2}{3}$	28 2 9	- - -	-	- - -	7 14 $1\frac{1}{4}$	0 19 8	20 16 0	- - -	- - -
Burntisland, -	2198	35	136 4 $3\frac{1}{2}$	2 6 4	-	- - -	70 4 10	1 4 2	- - -	66 8 4	8 18 3
Dysart, - -	7592	115	- - -	- - -	3	- - -	73 12 $8\frac{10}{12}$	1 1 $0\frac{1}{3}$	- - -	175 17 8	- - -
Kennoway, -	2061	$24\frac{2}{3}$	92 3 $2\frac{2}{3}$	14 0 $11\frac{2}{12}$	-	- - -	27 12 $11\frac{1}{3}$	3 10 10	- - -	56 13 4	- - -
Kinghorn, -	3922	43	110 4 $4\frac{2}{3}$	9 0 $11\frac{10}{12}$	-	- - -	30 15 $11\frac{1}{4}$	- - -	21 19 0	89 11 1	- - -
Kinglassie, -	1155	16	63 11 $11\frac{2}{3}$	8 15 1	-	- - -	10 13 $3\frac{1}{2}$	2 9 10	- - -	- - -	102 7 $3\frac{1}{4}$
Kirkaldy, - -	5261	83	182 18 11	29 19 9	3	35 17 10	210 14 11	- - -	2 10 0	141 11 0	1 15 0
Leslie, - - -	3625	32	101 18 9	- - -	1	25 7 2	41 19 8	5 9 8	- - -	55 10 8	- - -
Markinch, -	5500	- -	- - -	- - -	-	- - -	- - -	- - -	- - -	- - -	- - -
Scoonie, - -	2836	$42\frac{2}{3}$	211 0 0	47 19 3	2	21 10 0	66 12 0	1 5 0	- - -	166 13 4	- - -
Wemyss, - -	5751	$47\frac{2}{3}$	96 9 $1\frac{1}{2}$	10 10 9	-	- - -	30 12 6	11 7 $6\frac{1}{4}$	- - -	68 0 0	- - -
Total. -	46,694	541									

Synod of Fife.—*Presbytery of Dunfermline.*

Parishes.	Population.	Average Number of Ordinary Poor.	Average Annual Expense of the Poor.	Average Payments to Occasional Poor.	Number of Lunatics.	Average Expense of Lunatic Poor.	Average of Church Collections.	Average of Mortcloth and Marriage Fees.	Average of Mortifications.	Average of Voluntary Assessments.	Miscellaneous.
			L. s. d.	L. s. d.		L. s. d.	L. s. d.	L. s. d	L. s. d.	L. s. d.	L. s. d.
Aberdour, - -	1891	28⅓	88 3 8	5 0 7½	1	9 2 0	31 18 0	- - -	18 8 7	66 13 4	- - -
Beath, - - -	972	6	13 10 8	6 19 6	-	- - -	16 0 0	2 15 8	- - -	- - -	4 6 9¼
Carnock, - -	1270	8⅓	29 18 7	4 3 5	1	20 2 1½	11 9 4	0 8 8	8 6 8	- - -	- - -
Dalgety, - -	1261	18⅔	41 17 8⅔	0 8 8	-	- - -	18 16 9⅔	- - -	5 0 0	13 6 8	- - -
Dunfermline, -	19,778	359⅓	- - -	74 0 0	5⅓	109 0 0	50 11 11	- - -	120 0 0	1838 7 7	2 19 0
Inverkeithing, -	2978	37⅔	110 14 10	9 7 10½	1	16 13 4	19 3 8	- - -	- - -	115 10 1	16 13 4
Saline, - - -	1057	14⅓	68 15 10⅓	- - -	0⅔	6 9 11	34 11 11½	2 12 0	5 0 0	- - -	27 1 1⅓
Torryburn, -	1425	33	126 7 5⅓	1 7 5	1	25 7 8¼	23 12 4	1 3 2	- - -	165 11 1½	4 2 11⅓
Total, -	30,632	505⅔*									

* This shews that the number of paupers on the rolls of the several parishes amounts, on an average, to about 1⅔ per cent. of the whole population. But the average of the several parishes is very different; while the average of some of them is considerably under 1 per cent., others exceed two per cent.

Table shewing the Population of the different Parishes in the County of Fife, the Number of Paupers on the ordinary Poor's-Roll, the Proportion of the Paupers to the Population, and the Number of Public-Houses in each Parish.

Parishes.	Population by the Census of 1841.	Number of Paupers.	Proportion per Cent.	Number of Licensed Public-Houses.		
				Land-ward.	Burghs.	Total.
I. Presbytery of Dunfermline.						
1. Aberdour Parish, - - - -	1,891	28¼	1.50	15	--	--
2. Beath, - - - - - - -	972	6	0.62	5	--	--
3. Carnock, - - - - - -	1,270	8⅓	0.65	5	--	--
4. Dalgety, - - - - - - -	1,261	18⅔	1.48	7	--	--
5. Dunfermline, - - - - -	19,778	359⅓	1.71	67	85	152
6. Inverkeithing, - - - - -	2,978	37⅔	1.26	5	28	33
7. Saline, - - - - - - -	1,057	14⅓	1.35	3	--	--
8. Torryburn, - - - - - -	1,425	33	2.31	14	--	--
II. Presbytery of Kirkaldy.						
1. Abbotshall, - - - - - -	3,914	59	1.05	23	--	--
2. Auchterderran, - - - -	1,913	27	1.04	10	--	--
3. Auchtertool, - - - - -	530	7⅓	1.37	4	--	--
4. Ballingry, - - - - - -	436	8⅔	1.98	1	--	--
5. Burntisland, - - - - -	2,198	35	1.13	1	18	19
6. Dysart, - - - - - -	7,592	115	1.51	37	21	58
7. Kennoway, - - - - - -	2,061	24⅔	1.19	8	--	--
8. Kinghorn, - - - - - -	2,742	43	1.56	3	10	13
9. Kinglassie, - - - - - -	1,155	16	1.38	3	--	--
10. Kirkaldy, - - - - - -	5,261	83	1.57	1	60	61
11. Leslie, - - - - - - -	3,625	32	0.88	20	--	--
12. Markinch, - - - - - -	5,600	50⅔*	0.90	32	--	--
13. Scoonie, - - - - - - -	2,836	42⅔	1.05	27	--	--
14. Wemyss, - - - - - -	5,781	47⅔	0.82	41	--	--
III. Presbytery of Cupar.						
1. Abdie, - - - - - - - -	1,507	4	0.26	5	--	--
2. Auchtermuchty, - - - -	3,352	56⅓	1.68	4	20	24
3. Balmerino, - - - - - -	993	11⅔	1.17	4	--	--
4. Ceres, - - - - - - - -	2,950	48⅓	1.63	16	--	--
5. Collessie, - - - - - -	1,345	10	0.74	4	--	--
6. Criech, - - - - - - -	430	4	0.93	1	--	--
7. Cults, - - - - - - - -	889	10⅓	1.16	6	--	--
8. Cupar, - - - - - - - -	6,759	120	1.77	7	28	35
9. Dairsie, - - - - - - -	669	10⅔	1.58	2	--	--
10. Denbog, - - - - - - -	219	9⅓	4.24	0	--	--
11. Falkland, - - - - - -	2,885	23	0.79	8	8	16
12. Flisk, - - - - - - - -	270	5	1.85	0	--	--
13. Kettle, - - - - - - -	2,312	34	1.47	9	--	--
14. Kilmany, - - - - - -	659	12⅓	1.87	1	--	--
15. Logie, - - - - - - - -	419	8⅓	1.98	1	--	--
16. Monimail, - - - - - -	1,148	12⅔	1.05	3	--	--
17. Moonzie, - - - - - -	174	4⅓	2.48	0	--	--
18. Newburgh, - - - - - -	2,892	22	0.76	6	27	33
19. Strathmiglo, - - - - -	2,157	12⅔	0.58	8	--	--

* Taken from the General Assembly's Average of 1835-36-37.

Table shewing the Population, &c.—(continued.)

Parishes.	Population by the Census of 1841.	Number of Paupers.	Proportion per Cent.	Number of Licensed Public-Houses.		
				Land-ward.	Burgh.	Total.
IV. Presbytery of St Andrew's.						
1. Abercrombie or St Monance,	1,157	22	1.03	12	--	--
2. St Andrew's, - - - - -	6,033	102	1.69	10	44	54
3. St Leonard's, - - - - -	554	17	3.06	1	--	--
4. Anstruther Easter, - - -	1,014	12*	1.18	0	20	20
5. Anstruther Wester, - -	449	8$\frac{1}{3}$	1.85	0	3	3
6. Cameron, - - - - - - -	1,167	13	1.11	8	--	--
7. Carnbee, - - - - - -	1,043	14$\frac{1}{3}$	1.37	4	--	--
8 Crail, - - - - - - -	1,884	27†	1.43	1	10	11
9. Dunino, - - - - - -	471	6	1.27	1	--	--
10. Elie, - . - - - - - -	907	15	1.65	8	--	--
11. Ferry-Port-on-Craig, - -	1,741	16$\frac{2}{3}$	0.95	10	--	--
12. Forgan, - - - - - -	1,219	5$\frac{1}{3}$	0.43	6	--	--
13. Kemback, - - - - - -	780	15$\frac{1}{3}$	1.96	2	--	--
14. Kilconquhar, - - - - -	2,605	35	1.33	15	4§	19
15. Kilrenny, - - - - - -	2,039	10$\frac{2}{3}$	0.52	24	in both country and burgh.	
16. Kingsbarns, - - - - -	968	12	1.239	5	--	--
17. Largo, - - - - - - -	2,751	41$\frac{1}{3}$	1.50	12	--	--
18. Leuchars, - - - - - -	1,897	33$\frac{1}{3}$	1.75	12	--	--
19. Newburn, - - - - - -	419	7$\frac{2}{3}$	1.829	0	--	--
20. Pittenweem. - - - - -	1,349	33$\frac{2}{3}$‡	2.49	0	24	24

* The number on the Roll.
† Taken from the General Assembly's Average of 1835-36-37.
‡ Taken from the General Assembly's Tables of 1835-36-37.
§ These four are in Earlsferry.

' The number of Poor are the average of the years 1838, 1839, and 1840, taken from the return now made to the Commissioners of Supply, unless otherwise mentioned.

The number of licensed public-houses is taken from returns made by the clerks of the different districts, and the clerks of the royal burghs within the county, as on 27th March, 1843. Where there are two figures, the *first* is the number granted by the Justices of Peace, the *second* is the number within the royal burghs granted by the Magistrates, the *third* figure shews the total number in the parish.

The third line is the proportion of paupers to the total population.

MISCELLANEOUS NOTICES.

1. *Effect of Coloured Light on Plants.*—I planted in a box some curled cress seed, and so arranged bottles of carmine fluid, chromate of potassa, acetate of copper, and the sulphate of ammonia, that all but a small space of the earth was exposed to light which had permeated three-fourths of an inch of these media. For some days the only apparent difference was that the earth continued damp under the green and blue fluids, whereas it rapidly dried under the red and yellow. The plumula burst the cuticle in the blue and green lights before any change was evident in the other parts. After ten days, under the blue fluid there was a crop of cress, of as bright a green as any which grew in full light, and far more abundant. The crop was scanty under the green fluid, and of a pale unhealthy colour. Under the yellow solution but two

or three plants appeared, yet they were less pale than those which had grown in green light. Beneath the red bottle the number of plants which grew was also small, although rather more than in the spot the yellow covered. They too were of an unhealthy colour. I now reversed the order of the bottles, fixing the red in the place of the blue, and the yellow in that of the green. After a few days' exposure, the healthy cress appeared blighted, while a few more unhealthy plants began to shew themselves from the influence of the blue rays in the spot originally subjected to the red. It is evident from this that the red and yellow rays not merely retard germination, but positively destroy the vital principle in the seed. Prolonged exposure uncovered, with genial warmth, free air, and indeed all that can induce growth, fails to revive the blighted vegetation. I have repeated the experiments many times, varying the fluids, but the results have been the same. At this time I have the above facts strikingly exemplified where the space covered by the bichromate of potassa is without a plant. These results merit the attention of those who are engaged in the study of vegetable economy.—*Journal of the Franklin Institute.*

2. *Glass. The Ancients and the Moderns.*—The most singular art of forming pictures with coloured glass seems to have been practised by the ancients, which consisted in laying together fibres of glass of various colours, fitted to each other with the utmost exactness. They were cemented into a homogeneous mass. In some specimens of this art, which were discovered about the middle of the last century, the painting has, on both sides, a granular appearance, and seems to have been formed in the manner of mosaic work; but the pieces are so accurately united that not even with the aid of a powerful magnifying glass can the junctures be discovered. It is conjectured that this curious process was the first attempt of the ancients to preserve colours by fusing them into the internal parts of glass, which was, however, but partially done, as the surfaces have not been preserved from the action of the atmosphere. The earthern *amphoræ* received their name on account of the two ears or handles. (The proper form of the Greek word is *amphoreus.*) They are generally two feet, or two feet and a-half, in height; and the body, which is usually about six inches in diameter, ending upwards with a short neck, tapers towards the lower part almost to a point. The Attic Amphora contained three Roman Urnæ of 72 sextaries, equal to about two gallons, five pints and a-half, of English wine measure. Earthen amphoræ of the Roman time have been occasionally found in England. Like other domestic vessels of the Romans, they appear to have been sometimes used as funeral urns. Columella says they were used to preserve olive oil in. When filled with wine, they were usually lined with pitch, or some other coating, on account of the porous nature of the material of which they were formed.—*Polytechnic Journal*

3. *Cretan Melilot.*—A few seeds were sent me from the island of Crete, under the name of the Melilotus Creticum, as a plant that would be found highly useful for feeding cattle. The seed was sown the 25th of March, produced flowers in June, and by the middle of July it was covered with its highly fragrant yellow blossoms; ripened seed in August; height of the plants 20 inches. The Melilotus Creticum seems to be a valuable plant, and well calculated for growing in this country. It seems to possess all the properties sufficient to recommend it to the notice of agriculturists, particularly as its stalks are very succulent and its foliage very abundant; and when sown in autumn it may be cut and cleared from the ground in the beginning of June following, and the land fallowed for wheat or spring corn. It forms a valuable green food for cattle at an early period of the season; and, when cut in full flower, it yields a most abundant crop. It seems to be relished by all sorts of cattle, particularly milch cows, in consequence of its sweet herbaceous flavour, whether cut in a green state for food, or made into hay, and is a plant well adapted for making into hay, on account of its foliage, when dried, being found to impart to the whole crop an agreeable sweet scent, similar to that of the sweet-scented vernal grass, or Anthoxanthum odoratum. From its beautiful yellow spikes of flowers, it will form an elegant ornamental plant in every garden.—*Mr Taylor to the Royal English Agricultural Society.*

AGRICULTURAL REPORT.

June 1843.

oruary to June the weather has proved cold, the cold being indicated not so ery low range of the thermometer as by one's feelings; and, from that month condition of the weather has become gradually worse, inasmuch as, in- in has accompanied the coldness of the air. In May, the rain increased ly, so much as to deluge much of the lower lands of England, and to put turnip sowing in Scotland for several days; and, what may be consi- ırkable phenomena in the above period, (from February to June,) the west ch prevailed at its earlier part, have proved as cold as the east have in the ; and, contrary to usual experience, the west wind was accompanied with while the east brought inordinate quantities of rain. The east wind has ant for some time, and its prevalence at this late period of the season may accounted for by the fact of the snow having lingered for an unusual time in Russia. Another peculiarity of this season is the uninterrupted of the temperature. There have been no bursts of heat to encourage , and then returns of cold to check it; but cold, cold, always cold, whether ine or clouds. This state of the air has had the effect of bringing forward ınchecked in a gradual manner, and plants being subject to an equable re, though low, have conformed themselves to the conditions, and are hough, of course, much less advanced than at the same time last year, a period of heat and forwardness. There is now some heat.

ias been an unusual breadth of wheat sown this year; and, from what we stand—for we have not had leisure to ascertain it for ourselves—both it arley and oats look well, though late; and the opinion seems to be that, let ıer be ever so favourable, the general harvest cannot but be late. In crop extensive failures have been experienced, and, in many instances, we d of fields having been ploughed up for turnips. We think that the expe- last year and this, in regard to the state of the potato crop, is strikingly tive of the theory of constitutional weakness in the potato as being the ause of the failure; for observe the results. The *under-ripened* seed, the bad season of 1841, produced a crop without failure in 1842 in the *favourable* circumstances of heat and drought, while the *over-ripened* seed, the very fine season of 1842, has caused extensive failures in 1843 in the *vourable* circumstances of moisture and coolness. What should be the prac- ited by these results, but that *unripened* seed should be planted in all cases; event its becoming over-ripened in any season, let the potatoes intended e raised before they become ripe. It is feared that the breadth of Swedish l be much restricted this season, on account of the stoppage of their sowing and, as the land would thereby be rendered unfit for being properly time, the probability is, that the sowing of that crop has been performed ıfavourable circumstances, and the more unfavourable on the stronger soils. ture was late in rising, and what was early bitten by sheep became and bare, though what remained untouched has grown to a full bite for cattle. but heat is required, after the quantity of rain that has fallen, to make the od for the remainder of the season.

nbing season, both on low and high lands, was very favourable this season, ll of lambs has, in consequence, been prolific, there being an unusual num- ins in Leicester flocks. The prices of stock continue low except for fine t the price of good butcher meat in towns is not yet low, 7d. per lb. being nded for the best cuts. Lamb is still 3s. 6d. a quarter, and veal 8d. per lb. be the actual want of consumption of butcher meat by the labouring people d which restricts the sale of inferior pieces—for the best pieces will always rket amongst those who can afford to pay for them—we cannot account for ssed prices of stock; for all the importation of foreign stock and meat new law, as it has hitherto operated, we are convinced cannot have had of depressing prices so low as they are.

ain market has been as depressed as that of stock. By reference to the ıay be seen that the aggregate price of wheat, since the beginning of Novem- ıt of June, has only varied from 49s. 6d., the highest, to 45s. 5d., the lowest iteadiness which has never been witnessed in our time. If this steadiness has

arisen from want of speculation in corn, it shews that speculation does no good to markets, in as far as farmers are concerned; for it is their unsteadiness which renders the calculation of rents so difficult; and, if present rents have been calculated too high for present prices, it is obvious that rents, calculated on prices liable to be affected by the speculations of other people are placed on an unsafe basis for farmers. If the steadiness, on the other hand, has arisen from the restrictive check afforded by the new law on the power of speculators to affect prices beyond their natural level, then the new law has worked well, and has removed the cause of those complaints of the agriculturists themselves against the old law which was avowedly concocted to encourage speculation. In so far as the farmer is concerned in prices, he should receive those which indicate the natural value of the products which he raises—and this value is determined by the natural consumption of those products. Securing this, and paying rent accordingly, he would be placed in the proper position he should occupy, both in regard to the consumers of his products and the owner of the soil from which he raises them.

We observe that Lord Ducie has become an agitator of the Anti-Corn-Law League; and if his Lordship's sentiments, as reported, are oracular with the farmers, on this subject, as his farming seems to be, they must henceforth believe that all the corn laws which have existed in this country for generations have done no good to agriculture, but, on the contrary, have actually prevented agricultural improvement! *Credat Judæus.* We think that a greater outcry has been made by farmers about the Canada flour bill than its construction warrants. The entire change effected by it, is to fix a duty on Canadian wheat at 1s. a-quarter, instead of a duty varying from 1s. to 5s. per quarter; and which, on the average of the last few years, has been 2s. 1d. per quarter; and to impose a duty of 3s. per quarter on the import of wheat from the United States into Canada, instead of its being free of duty, as at present. The remarks which these changes seem to call forth are, that wheat is a bulky and heavy article to smuggle from Illinois through Canada to this country; and it is only in six months of the year it can be so sent—for it must come down the St Lawrence; and as to smuggling it into Canada to grind, the Canadian millers will take care to pocket the duty, in the shape of profit. The only danger to be apprehended, as we conceive, is the smuggling of United States' *flour* into Canada, and its transmission to this country as *Canadian* flour. To check such a fraud, a brand should be put on the casks of flour really ground in Canada; and the Canadian flour mills that grind flour for this country should be all licensed. As to stirring this question at the present juncture, when agriculture is otherwise depressed, we suspect that our legislators could not help themselves. No doubt, it is still in the option of her Majesty to grant or refuse assent to any measure framed by the Canadian legislature; but the power to refuse assent to any act of the legislature is at all times exercised by the Sovereign with great reluctance; and, in the present case, it would appear ungracious to refuse assent to the first act of a new assembly, under the new constitution recently granted by this country to Canada. If any portion of the people of this country consider themselves aggrieved by the very first act of the new assembly of Canada, they ought to consider that it was their *own* legislators who granted *that* constitution, and they *must* now abide the consequences of its working, whether for good or whether for evil.

Most of our readers are, no doubt, aware, by this time, by the advertisements which have issued from the Highland and Agricultural Society, that a material alteration was contemplated in the form and price of this Journal. The reasons and circumstances which have given rise to the alteration now effected, being so lucidly stated in the Preliminary Notice prefixed to the Transactions of the Society, accompanying the present Number of this Journal, renders it unnecessary for us to say anything on the subject. We join in hope with the Directors that "the new Journal, with its advantages of cheapness, condensation, and facility of delivery, will speedily acquire a very widely extended circulation, not only in Scotland, amongst the Society's members and local associations, but the public in general;" and, that the Journal may be rendered still more acceptable to farmers than it has hitherto been, we earnestly request their co-operation in supplying us with the results of their experience, which we know they can do if they *will*. In doing this, there is no necessity for taking the trouble of putting them together in the shape of a finished essay. No matter in what shape the manuscript reaches *us*, for it shall be our pleasure, as well as our duty, to make both opinions and facts entrusted to us appear to the best advantage before our readers.

TABLE OF PRICES, &c.

s of the different kinds of GRAIN, per Imperial Quarte:, sold at the following Markets:—

LONDON.

...ry.	Oats.	Rye.	Pease.	Beans.
d.	s. d.	s. d.	s. d.	s. d.
0	17 3	28 6	30 2	29 1
2	17 10	29 8	30 6	29 4
1	18 3	30 2	29 10	28 0
4	18 2	28 4	29 6	28 8
5	18 2	28 9	28 8	27 8
1	18 4	29 2	28 4	27 2
0	18 2	28 6	29 2	28 6
8	18 4	27 4	29 6	26 10
1	18 1	26 6	28 8	26 2
10	17 7	28 2	28 6	26 10
0	17 4	29 4	27 8	26 11
2	17 9	28 4	27 4	25 9
4	17 10	29 2	26 10	23 7
1	17 4	27 10	26 4	27 0
5	17 5	28 10	27 8	27 4
7	17 6	27 10	27 3	27 8
2	18 2	28 1	27 9	28 2

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1843.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 1.	48 4	28 7	18 4	31 6	31 0
8.	48 8	29 2	18 8	31 0	30 4
15.	47 3	30 4	19 2	30 0	30 6
22.	48 6	30 6	19 0	29 7	30 4
Mar. 1.	48 9	31 2	19 4	30 0	30 6
8.	47 5	30 8	20 0	29 8	30 1
15.	46 2	31 1	19 8	30 0	30 6
22.	48 7	32 5	21 3	30 4	30 8
29.	48 1	31 6	20 7	30 3	30 7
April 5.	48 9	31 1	20 1	29 2	29 5
12.	49 6	30 2	19 9	29 6	29 10
19.	48 5	29 8	19 9	30 0	30 6
26.	47 4	29 10	19 6	29 9	30 1
May 3.	47 11	29 6	19 8	29 9	30 2
10.	48 11	29 9	19 3	30 0	30 6
17.	49 11	32 0	19 7	28 8	29 6
24.	49 0	29 8	19 11	30 0	30 6

LIVERPOOL.

...ry.	Oats.	Rye.	Pease.	Beans.
d.	s. d.	s. d.	s. d.	s. d.
8	16 10	28 7	30 4	30 6
10	17 1	29 4	30 8	29 11
11	16 11	28 10	29 8	30 0
0	17 6	28 6	29 4	31 7
1	19 9	28 4	29 2	31 4
5	17 5	28 1	28 6	28 2
4	17 1	27 10	29 2	28 0
0	17 3	28 3	29 8	30 7
11	16 5	27 9	29 4	26 2
6	15 2	28 4	28 10	29 3
2	16 8	28 6	28 4	28 0
4	16 2	28 10	24 2	28 4
9	15 9	28 6	27 9	31 0
0	15 10	29 2	28 3	28 6
3	16 1	28 10	28 6	29 6
2	17 8	27 10	28 2	28 8
4	16 3	28 2	28 9	29 7

DUBLIN.

Date.	Wheat.	Barley.	Bear.	Oats.	Flour.
1843.	s. d.	s. d.	s. d.	s. d.	s. d.
Feb. 3.	28 0	13 6	10 2	9 6	16 6
10.	28 3	11 10	9 8	8 9	16 4½
17.	28 5	12 1	9 6	8 10	16 3½
24.	27 4	11 8	9 4	8 9	16 6
Mar. 3.	27 1	11 9	9 6	8 10	16 4½
10.	26 8	13 3	10 2	8 11	15 10
17.	27 6	13 6	10 6	9 3	15 9½
24.	25 2	12 4	10 1	8 10	15 8½
31.	26 10	12 10	10 4	8 11	15 8
April 7.	27 5	11 1	10 0	9 2	15 3
14.	26 3	12 3	10 5	8 8	15 5
21.	27 5	12 7	10 8	8 7	15 4½
28.	26 6	12 8	11 2	9 0	15 8
May 5.	25 1	12 4	11 2	8 9	15 8½
12.	27 4	13 5	11 6	9 2	15 8½
19.	28 10	12 11	11 8	9 11	15 8
26.	30 4	13 2	12 0	9 7	16 1

e Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties payable CORN: the Duties payable thereon, from February to May, 1843.

...y.	Barley.			Oats.			Rye.			Pease.			Beans.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
0	27 5	26 11	10 0	16 9	17 0	8 0	28 2	29 3	11 0	29 11	30 0	10 6	27 3	27 9	11 6
0	27 1	27 0	9 0	16 10	16 11	8 0	30 1	29 7	11 0	30 1	29 11	11 6	27 5	27 7	11 6
0	27 2	27 1	9 0	17 0	16 11	8 0	27 9	29 0	11 0	29 5	29 11	11 6	27 0	27 5	11 6
0	27 2	27 3	9 0	17 1	16 11	8 0	28 4	28 10	11 6	30 1	29 11	11 6	26 11	27 4	11 6
0	27 4	27 4	9 0	17 3	17 0	8 0	29 0	28 11	11 6	28 6	29 9	11 6	26 7	27 2	11 6
0	27 7	27 3	9 0	17 2	17 0	8 0	28 4	28 7	11 6	29 4	29 7	1. 6	26 6	27 0	11 6
0	27 11	27 4	9 0	17 4	17 2	8 0	26 10	28 5	11 6	28 6	29 4	11 6	26 8	26 10	11 6
0	28 4	27 7	9 0	17 7	17 3	8 0	29 3	28 3	11 6	28 11	29 2	11 6	26 3	26 8	11 6
0	28 6	27 10	9 0	17 4	17 3	8 0	29 4	28 6	11 6	28 5	29 0	11 6	26 0	26 6	11 6
0	28 8	28 1	9 0	17 2	17 4	8 0	29 3	28 8	11 6	26 11	28 5	11 6	26 2	26 4	11 6
0	28 8	28 3	9 0	17 1	17 4	8 0	29 2	28 8	11 6	28 1	28 4	11 6	25 10	26 3	11 6
0	28 5	28 4	9 0	17 4	17 4	8 0	28 7	28 9	11 6	27 5	28 0	11 6	25 11	26 2	11 6
0	28 7	28 6	9 0	17 0	17 4	8 0	29 3	29 2	11 6	28 3	28 1	11 6	26 3	26 1	11 6
0	28 2	28 6	9 0	17 2	17 3	8 0	27 7	28 10	11 6	28 1	27 10	11 6	26 4	26 2	11 6
0	28 1	28 5	9 0	17 5	17 3	8 0	29 2	28 10	11 6	28 9	27 11	11 6	26 8	26 2	11 6
0	27 9	28 3	9 0	17 5	17 4	8 0	29 2	28 10	11 6	28 2	28 1	11 6	26 10	25 4	11 6
0	27 5	28 1	9 0	17 11	17 5	8 0	29 9	28 9	11 6	28 6	28 9	11 6	28 0	27 9	11

The ***MONTHLY RETURNS,*** *published in terms of 9th Geo. IV. c. 60, shewing the*
Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month;
upon which duties have been paid for home-consumption, during the same Month; an
tities remaining in Warehouse at the close thereof, from 5th January to 5th May 1843.

Month ending	IMPORTED. From Foreign Countries.	From British Possessions.	Total.	CHARGED WITH DUTY. From Foreign Countries.	From British Possessions.	Total.	REMAINING I[N WAREHOUSE] From Foreign Countries.	Fro[m British Possessions]
Feb. 5, 1843.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Q
Wheat,	7,017 5	1,914 7	8,932 4	224 0	1,911 2	2,135 2	218,229 2	49,
Barley,	. .	. .	. .	6,536 3	. .	6,536 3	53,305 3	.
Oats,	. .	155 4	155 4	1,653 1	155 4	1,808 5	55,377 1	.
Rye,	. .	. .	. .	. .	. .	. .	1,366 6	.
Pease,	1,113 7	163 7	1,277 6	752 2	37 7	790 1	28,151 2	
Beans,	16,882 7	. .	16,882 7	2,254 3	. .	2,254 3	107,461 1	.
Totals,	25,014 3	2,234 2	27,248 5	11,420 1	2,104 5	13,524 6	463,979 7	4,5
Mar. 5, 1843.								
Wheat,	8,026 4	1,266 0	9,292 4	754 6	1,095 3	1,850 1	221,218 6	4,
Barley,	10 0	. .	10 0	1,124 0	. .	1,124 0	51,631 0	.
Oats,	622 2	. .	622 2	816 2	. .	816 2	51,683 2	.
Rye,	. .	. .	. .	. .	. .	. .	1,026 6	.
Pease,	533 2	1 0	534 2	1,701 6	1 0	1,702 6	26,521 0	
Beans,	9,902 0	. .	9,902 0	2,598 6	. .	2,598 6	112,153 7	.
Totals,	19,294 0	1,267 0	20,561 0	7,125 4	1,096 3	8,121 7	464,284 5	5,0
April 5, 1843.								
Wheat,	9,810 5	1,573 4	11,384 1	1,682 6	1,070 4	2,753 2	220,901 4	4,5
Barley,	771 2	. .	771 2	1,904 3	. .	1,904 3	49,863 2	.
Oats,	1,467 3	. .	1,497 3	95 5	. .	95 5	48,303 6	.
Rye,	. .	. .	. .	. .	. .	. .	57 7	.
Pease,	500 4	. .	500 4	407 4	66 7	474 3	26,386 3	
Beans,	2,351 2	. .	2,351 2	2,308 2	. .	2,308 2	111,201 1	.
Totals,	15,011 0	1,573 4	16,584 4	6,458 4	1,137 3	7,595 7	456,593 7	5,
May 5, 1843.								
Wheat,	14,234 3	166 5	14,401 0	2,415 4	925 6	3,341 2	227,055 6	4,
Barley,	14,690 7	. .	14,690 7	14,725 3	. .	14,725 3	49,292 7	.
Oats,	4,146 6	. .	4,146 6	81 6	. .	81 6	44,146 3	.
Rye,	. .	. .	. .	. .	. .	. .	57 2	.
Pease,	82 4	22 4	115 0	382 5	145 7	528 4	24,005 5	
Beans,	5,980 2	. .	5,980 2	2,141 2	. .	2,141 2	112,317 4	.
Totals,	39,152 6	189 1	39,351 7	10,746 4	1,071 5	20,818 1	452,975 3	4,5
Feb. 5, 1843.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cw
Flour,	1,307 1 14	25,814 2 11	27,121 3 25	199 3 8	13,090 2 16	13,290 1 24	45,447 3 8	74,0
Oatmeal,	. .	51 1 16	51 1 16	. .	51 1 16	51 1 16	17 1 6	1
Totals,	1,307 1 14	25,865 3 27	27,173 1 13	199 3 8	13,142 0 4	13,391 3 1[illegible]	45,465 0 14	75,0
Mar. 5, 1843.								
Flour,	2,125 0 15	1,489 3 4	3,614 3 19	38 1 16	14,738 1 3	14,776 2 19	42,901 3 13	60,9
Oatmeal,	. .	. .	. .	. .	. .	. .	17 1 6	1
Totals,	2,125 0 15	1,489 3 4	3,614 3 19	38 1 16	14,738 1 3	14,776 2 19	42,919 0 19	61,0
April 5, 1843.								
Flour,	7,451 1 24	5,070 2 4	13,121 0 0	28 2 12	14,060 2 8	14,088 0 20	44,533 1 18	51,
Oatmeal,	. .	110 2 18	110 2 18	7 3 14	. .	7 3 14	9 2 22	2
Totals,	7,451 1 24	6,081 0 22	13,5[illegible]1 2 18	36 1 26	14,060 2 8	14,096 0 6	44,543 0 12	51,5
May 5, 1843.								
Flour,	19 0 16	711 2 21	730 3 9	41 2 11	21,880 1 11	21,921 3 22	43,205 1 18	33,1
Oatmeal,	. .	24 1 16	24 1 16	. .	234 2 12	234 2 12	9 0 12	
Totals,	19 0 16	736 0 9	755 0 25	41 2 11	22,114 3 23	22,156 2 6	43,214 2 2	33,1

*PRICES of BUTCHER-MEAT.**

Date.	LONDON, *Per Stone of 14 lb.* Beef.	Mutton.	MORPETH, *Per Stone of 14 lb.* Beef.	Mutton.	EDINBURGH, *Per Stone of 14 lb.* Beef.	Mutton.	GL[ASGOW,] *Per S[tone]* Beef.
1843. February.	5/9 to 7/9	6/3 to 7/9	5/6 to 7/0	5/9 to 7/6	6/ to 7/	6/3 to 7/3	6/3 to 7/
March.	5/6 7/6	6/ 7/3	5/3 7/	5/6 7/	5/6 6/9	6/ 7/	5/9 7/
April.	5/6 7/3	5/9 7/3	5/3 6/9	5/ 6/6	5/3 6/6	5/9 6/9	5/6 6/
May.	5/9 7/3	5/9 7/6	5/6 7/	5/6 6/9	5/6 6/9	5/9 7/	5/9 7/

PRICES of English and Scotch WOOL.

[English], per 14 lb.			Scotch, per 14 lb.	
Merino	13/6 to 16/6		Leicester Hogg,	12/6 t[o]
in grease	11/6	13/6	Ewe and Hogg,	11/
South Down,	12/	14/6	Cheviot, white,	10/6
Half Bred,	11/	12/6	Laid, washed,	7/6
Leicester Hogg,	13/6	16/6	unwashed,	6/3
Ewe and Hogg,	11/	13/6	Moor, white,	6/
[illegible]	5/	6/6	Laid, washed,	4/9

THE REVENUE.

T of the Nett Produce of the Revenue of Great Britain, in the Quar-
l Years ended on the 5th April, 1842, and 5th of April, 1843—
the Increase and Decrease on each head thereof.

	Quarters ending April 5. 1842.	Quarters ending April 5. 1843.	Increase.	Decrease.	Years ending April 5. 1842.	Years ending April 5. 1843.	Increase.	Decrease.
	L.	L.	L.	L.	L.	L.	L.	L.
.	4,495,053	4,219,537	. .	275,516	19,876,130	18,799,794	. .	1,076,336
.	1,769,161	1,767,373	. .	1,788	12,464,609	11,405,516	. .	1,059,093
.	1,599,487	1,593,166	. .	6,361	6,631,529	6,484,729	. .	146,790
.	150,753	142,698	. .	8,055	4,411,619	4,265,537	. .	146,082
.	142,000	144,000	. .	2,000	504,000	607,000	103,000	. .
.	373,693	574,556	200,863	. .	551,805	915,274	363,469	. .
.		1,885,232	1,885,232	. .	. .	2,456,288	2,456,288	. .
			2,086,095	293,720	44,439,692	44,934,148	2,922,757	2,428,301
	Deduct Decrease.		293,720		Deduct Decrease.		2,428,301	
	Increase on the Qr.		1,792,375		Increase on the Year.		494,456	

ICES of the different COUNTIES of SCOTLAND, for Crop and Year 1842, by the Imperial Measure.

NSHIRE.

	Imp. qr.
dder, .	
r, ...	
dder, . . .	25/
. . . .	31/
r, . . .	22/6
. . . . .	30/6
out fod.,	16/6
fodder,	26/6
ithout fod.,	15/
ith fodder,	25/
. . . . .	23/
. . . . .	24/
. . . . .	11/9
l, ...	43/9

YLE.

. . . . .	39/
. . . . .	27/8
. . . . .	23/8
. . . . .	17/6
. . . . .	26/8
. . . . .	13/10½

R.

. . . . .	43/11
. . . . .	25/5
. . . . .	23/4½
. . . . .	14/6½
. . . . .	34/3½
. . . . .	15/

FF.

dder, .	45/8
dder, . .	23/8
, ...	28/8
t fodder,	21/2
dder, .	26/2
out fod.,	20/2
fodder,	25/2
ut fod.,	17/7
fodder,	25/7
out fod.,	15/5
fodder,	23/5
. . .	23/
. . .	23/
. . .	11/6

BERWICK.

	Imp. qr.
Wheat,	44/10 $\frac{7}{12}$
Barley, Merse,	23/11 $\frac{9}{12}$
—— Lammermuir,	22/3 $\frac{8}{12}$
Oats, Merse,	18/9 $\frac{8}{12}$
—— Lammermuir,	17/3 $\frac{7}{12}$
Pease,	30/7 $\frac{6}{12}$
Oatmeal, per 140 lb	13/11 $\frac{6}{12}$

BUTE.

Wheat,	
Barley,	
Bear,	
Oats,	
Pease,	
Beans,	
Oatmeal, per 140 lb	

CAITHNESS.

Bear,	19/3½
Oats, Potato,	15/9
—— Angus,	15/8
—— Sandy,	17/
—— Dun,	15/
—— Red,	16/10½
—— Black,	12/9½
Oatmeal, per 140 lb	13/5

CLACKMANNAN.

Wheat,	44/2¾
Barley, Kerse,	24/10¼
—— Dryfield,	21/10
Oats, Kerse,	18/1½
—— Dryfield,	17/7
Pease and Beans,	28/6
Malt,	47/1¾
Oatmeal, per 140 lb	13/10¾

DUMBARTON.

Wheat,	43/6
Barley,	26/9
Bear,	24/9
Oats,	18/5
Pease and Beans,	31/2
Oatmeal, per 140 lb	14/9

DUMFRIES.

	Imp.
Wheat,	47/6
Barley,	25/0¾
Bear,	25/2
Oats, Potato,	16/9
—— Common,	15/7
Pease,	
Beans,	34/9
Malt,	58/8
Oatmeal, per 140 lb	13/1½

EDINBURGH.

Wheat, First,	45/
—— Second,	42/
Barley, First,	27/6
—— Second,	26/6
—— Third,	25/6
Oats, First,	19/
—— Second,	17/6
Pease and Beans,	28/6
Oatmeal, per 112 lb	
—— per 280 lb	27/6

ELGIN & MORAY.

Wheat,	43/7
Barley,	23/2
Oats,	17/7
Pease and Beans,	31/8
Oatmeal, per 112 lb	11/5

FIFE.

Wheat, White,	43/3
—— Red,	41/1
Barley,	24/2
Bear,	22/2
Oats,	17/5
Pease and Beans,	26/3½
Rye,	21/8
Malt,	49/10
Oatmeal, per 280 lb	27/7

FORFAR.

Wheat,	41/
Barley,	23/4
Bear,	21/3

FORFAR *(Continued.)*

	Imp. qr.
Oats, Potato,	16/11
—— Common,	16/1
Pease and Beans,	23/2
Rye,	24/9
Oatmeal, per 140 lb.	12/4

HADDINGTON.

Wheat, First,	52/0½
—— Second,	48/11
—— Third,	45/8½
Barley, First,	30/5½
—— Second,	28/3½
—— Third,	25/11¾
Oats, First,	21/7½
—— Second,	19/11½
—— Third,	18/3½
Pease and Beans, First,	29/0½
—— Second,	27/8½
—— Third,	25/6

INVERNESS.

Wheat,	41/8
—— with fodder,	48/2
Barley,	23/
—— with fodder,	29/8
Bear,	20/6
Oats, potato,	18/3
—— with fodder,	25/6
—— Common,	17/4
—— with fodder,	25/6
—— Black,	7/6
—— with fodder,	12/6
Oatmeal, per 112 lb	13/2

KINCARDINE.

Wheat, without fodder,	44/11½
—— with fodder,	56/11½
Barley, without fodder,	21/7¾
with fodder,	30/7¾
Bear, without fodder,	19/9
—— with fodder,	28/9
Oats, Potato, without fod.	16/8
—— with fodder,	26/8
—— Common, without fod.,	15/3½
—— with fodder,	25/3½
Pease, without fodder,	22/
—— with fodder,	33/
Beans, without fodder,	23/6½
—— with fodder,	34/6½
Oatmeal, per 140 lb	12/5$\frac{1}{12}$

KINROSS.

Wheat,	38/8
Barley, First,	25/6
—— Second,	22/6
Bear, First,	
—— Second,	
Oats, White, First,	17/3
—— Second,	15/3
—— Black, First,	14/9
—— Second,	12/9
Pease,	28/3
Oatmeal per 280 lb	26/7

KIRKCUDBRIGHT.

Wheat,	48/4
Barley,	24/4
Bear,	
Oats, Potato,	15/8
—— Common,	14/4
Oatmeal, per 140 lb	12/6

LANARK.

	Imp. qr.
Wheat, First.	46/2
—— Second,	42/10$\frac{10}{12}$
—— Third,	42/
Barley, First,	27/2$\frac{4}{12}$
—— Second,	24/6$\frac{8}{12}$
Bear, First,	23/7
—— Second,	19/4
Oats, First,	17/5$\frac{8}{12}$
—— Second,	14/11$\frac{4}{12}$
Pease,	31/4$\frac{4}{12}$
Beans,	31/6
Malt,	52/10$\frac{3}{12}$
Oatmeal, per 140 lb	12/4$\frac{8}{12}$

ARCHBISHOPRIC OF GLASGOW.

Barley,	27/2$\frac{4}{12}$
Oats,	17/6
Malt,	52/10
Oatmeal, per 140 lb	14/6

LINLITHGOW.

Wheat,	44/11
Barley,	25/6
Oats,	17/4
Pease,	28/7
Oatmeal,	10/9½

NAIRN.

Wheat,	42/
Barley, without fodder,	22/6
—— with fodder.	28/6
Oats, without fodder,	18/
—— with fodder,	28/
Oatmeal, per 112 lb	12/6

ORKNEY.

Bear, per 367½ lb,	13/6¾
Malt, without duty,	15/11
Otameal, per 140 lb	10/

PEEBLES.

Wheat, First,	47/8½
—— Second,	44/7½
—— Third,	40/1½
Barley, First,	26/7½
—— Second,	24/9½
—— Third,	23/5½
Oats, First,	17/6½
—— Second,	16/5½
—— Third,	15/3
Pease, First,	32/9½
—— Second,	31/8½
—— Third,	30/3½
Oatmeal, First, per 140 lb	13/6
—— Second,	13/0¾
—— Third,	12/10

PERTHSHIRE.

Wheat, First,	45/10
—— Second,	40/
Barley, First,	23/10
—— Second,	20/10
Oats, First,	16/8½
—— Second,	14/
Pease and Beans,	24/3½
Oatmeal, per 140 lb	12/11

RENFREW.

Wheat, First,	
—— Second,	
Barley, First,	
—— Second,	
Bear, First,	
—— Second,	
Oats, First,	
—— Second,	
Beans, First,	
—— Second,	
Oatmeal, per 140 lb	

ROSS AND CROMA[illegible]

Wheat,	
Barley,	
Bear,	
Oats, First,	
—— Second,	
Pease and Beans,	
Oatmeal, per 140 lb	

ROXBURGH.

Wheat,	
Barley,	
Oats,	
Pease,	
Beans,	
Oatmeal, per 140 lb	

SELKIRK.

Wheat,	
Barley,	
Oats, Potato,	
—— Common,	
Pease and Beans,	
Oatmeal, per 280 lb	

STIRLING.

Wheat,	
Barley, Kerse,	
—— Dryfield,	
Oats, Kerse,	
—— Dryfield,	
—— Muirland,	
Pease and Beans,	
Malt,	
Oatmeal, per 140 lb	

SUTHERLAND.

Wheat,	
Barley,	
Bear,	
Oats,	
Pease,	
Oatmeal, per 140 lb	

WIGTON.

Wheat,	
Barley,	
Bear,	
Oats, Potato,	
—— Common,	
Malt,	
Pease and Beans,	
Oatmeal, per 280 lb	

We may inform our English readers, that Fiar Prices are the average prices of grain, as ascertai[ned every] year by the verdict of Juries in every county of Scotland. These Juries are summoned in spring, and [illegible] from the evidence produced to them, the average prices of the preceding crop. By these prices, rent[s paid i]n grain, and similar contracts, are generally determined; but the main object is to convert into [money the] stipends (for the most part fixed at a certain quantity of grain) of the Scottish Clergy.

LAND-LABOUR AND CAPITAL.

By Joshua Trimmer, F.G.S., &c.

The present state of this country is truly anomalous. We are starving in the midst of plenty, staggering beneath the weight of our resources. Land-labour and capital, the elements of national prosperity, we possess in superabundance; but, from want of combination, they are weakness instead of strength to us. We have capital wanting employment, labourers wanting food, land capable of supplying that food, but unproductive for want of capital wherewith to employ labour.

We have such masses of accumulated wealth, that the low rate of interest which it yields causes every commercial and manufacturing pursuit to be ruined, like the iron trade, by the glut of capital poured into it.

We have the most hardy and industrious peasantry, and the most skilful artisans in the world, starving for want of employment, demanding, with lowering looks and angry tone, a fair day's wages for a fair day's work, and threatening, as the alternative, destruction to all our time-honoured institutions. Our population increases so rapidly that we are obliged to import corn, because our soil at present in cultivation, and as at present cultivated, does not yield enough to feed them; but we have, at the same time, sufficient land uncultivated, or in a state of half cultivation, to furnish them, if capital were applied to it, with the means of subsistence for several generations, even at their present rate of increase; and, in our colonies, there are millions of fertile acres, under every variety of climate, equal to many times the area of the whole of the British islands.

Various are the remedies proposed for this state of things. We have those whom nothing will satisfy short of a re-distribution of property—others who will be content with a depreciation of the currency and an extension of the elective franchise, which shall swamp property beneath the flood of numbers—we have conservative declaimers in favour of the rights of the poor to support without labour, denouncers of the cruelty of separating man and wife while subsisting on alms—railers against the robbery of enclosing commons—and we have practical men who act upon these theories, by levelling enclosures, demolishing turnpike gates, and attacking the union work-houses.

Some would have us make the country the work-shop of the world, import the whole of our food, and leave to other nations the profitless pursuits of agriculture. The possessors of land, on the contrary, tell us that too many of our population are,

already, dependant on the fluctuating demands of foreign trade—that the land is the great source of wealth—the home market the best—protection to agriculture everything—and that all that is required, in order to make us prosperous and happy, is to exclude, by prohibitory duties, every production of foreign countries which can possibly be grown at home—and that, adhering steadily to this policy, and putting down agitation for free trade, even at the point of the bayonet, we shall so stimulate cultivation, as ultimately to reduce the price of food, and bring back the good old times, ere cotton, steam, and railroads cursed the land, when, instead of importing, we were exporters of wheat and wool. The political economists, to whatever school they belong, tell us that all our misfortunes have arisen from forcing the growth of corn upon inferior soils, while most of those who contend that we ought to extend home cultivation tell us, in the same breath, that British agriculture, with all its improvements all its cattle-shows, all its agricultural associations, all our means of internal transport, and all our long line of coast, cannot compete with the rude tillage of the European and American continents—and the high-priced labour of the latter—whose produce must be transported from the interior to the coast through hundreds of miles of bad roads, and is then burthened with the expense of a long sea voyage before it can reach our markets Some expect wonders from the application of science to agriculture and the diffusion of knowledge among the farmers; others consider that they are already too much of gentlemen and theorists, regret the disappearance of small farms, smock-frocks, and hob-nails, and contend that no man can cultivate the soil properly who is not as ignorant as his own horses.

Some attribute every evil under which we suffer to th increase of our numbers, and invoke a war or a pestilence t restore the equilibrium between population and the means o subsistence; some, more humane, would substitute emigration a a remedy; others declaim against the cruelty of transportin the poor to perish in swamps and deserts, and declare that emi gration has done all the mischief; while some would found ne colonies others would consider it a blessing were we to lose thos which we at present possess. Home colonization, spade hus bandry, and cottage allotments, are the grand panacea of th humane and the popularity hunters; and the days of Auburn when "every rood of ground maintained its man," are to b eclipsed by a new golden age, when half that space shall suffic to enable the peasant, freed from the dominion of a hard maste and a greedy capitalist, to support himself in independence an comfort.

From free trade more benefits are expected by one party tha

it can ever realize, more evils dreaded by the other than it will ever produce. One man, the proverb tells us, can take a horse to water, but fifty cannot make him drink. We may admit foreign corn, but we cannot make the Zollverein take our hardware and our cottons. Foreign nations see that our commerce and manufactures are the source of our wealth; they are determined to manufacture for themselves; they know that, on equal terms, they cannot compete with us. Every step we take towards free trade has hitherto been met by a more exclusive policy on their part; and we certainly shall not promote the interests of our manufactures by such an abandonment of our system of agricultural protection as shall put it out of the power of the government to demand equivalent concessions. Justice to the owners of the large amount of capital embarked in the cultivation of the soil equally demands that the transition from a long-established system, however bad, to a better, shall be gradual; for, though it is not probable that a free trade would permanently reduce the price of produce below the level which it has attained under that relaxation of the landed monopoly which has already taken place, and from which there is no return, and though, were it not for existing contracts, natural prices would be the best for the cultivator, yet there are numerous engagements which have grown out of the artificial system so long persevered in, which ought to be allowed time to expire; and, therefore, the best course would have been, some fourteen years back, to have imposed a fixed duty on foreign wheat of 10s. or 12s. the quarter, to be gradually reduced till it reached the nominal or registering duty of 1s.; but the days for that are gone by, and the best arrangement now, for all parties, would be a fixed duty of 8s. or 10s., with power to the executive government to reduce the amount one half, in favour of those nations with whom they could conclude satisfactory treaties.

It is scarcely necessary to waste a word in vindication of emigration. The fact that the population increases at the annual rate of 230,000, in the face of an annual average emigration, during the last eighteen years, of 62,671, and the fact that the Australian colonies alone take very nearly one-fifth of all our exports, are sufficient proofs that excessive emigration cannot have drained the land of its labourers or its capital.

A feeling, moreover, has become general among thinking men, that the extension of our commerce and manufactures has of late been too rapid to be healthy; that to the land, either in the colonies or at home, we must look for the employment of our surplus labour and surplus capital; that we must extend the base if we would give stability to the lofty superstructure which has been raised so suddenly; that, as the prosperity of our agriculture

requires our present number, at least, of manufacturing consumers, so our manufactures require an increased and increasing body of producers of food and raw material to be exchanged for manufactured goods. It is desirable, moreover, that these producers of food and raw material should be subjects of the British crown, so that we may have nothing to fear in them from hostile tariffs and rival manufactures. The question is, whether it is most practicable, and most beneficial to the community, that they should be established on our own soil or in the colonies.

The labouring classes, those who would most benefit from a transfer to the colonies, are prejudiced against emigration, and are looking to the land at home for a maintenance which it cannot afford them. This prejudice has arisen from a variety of causes—want of education, which prevents them from understanding their true interests, and from being aware of the increase of their numbers, and its effect in depreciating the value of their labour—the habit of regarding the boundary of their parish as the boundary of the world, which has been engendered by ignorance and the working of our poor laws—that feeling of attachment to home and kindred, which induces many of the educated and middle classes to linger here against their better conviction. These prejudices are fostered by those who live by agitation, who see in emigration a safety-valve for popular discontent, which they are unwilling to have opened, and those who, with views less mischievous, find it to be their interest to fall in with every popular delusion. Neither has the mode in which emigration has hitherto been conducted been calculated to remove these prejudices. The first colonies founded by us, after the loss of those which we possessed in America, were designed merely as receptacles into which to empty the contents of our jails. When their resources began to develop themselves, and these new colonies began to be regarded as the means of extending our empire, of increasing the national resources, and of improving the condition of the labouring classes, the plague-spot of their penal origin, and the contamination of society engendered by it, deterred respectable settlers of the middle ranks from availing themselves of the pecuniary advantages which they held out; and it is not surprising that the same feeling should extend to the labouring classes, and that they should look with suspicion on the motives of those who would induce them to expatriate themselves to that Botany Bay which was held out to the felon as a punishment, though it was not such in reality.

Nor was it unnatural that attempts to promote free emigration to a penal colony, by means of the machinery of the poor law, should be regarded as the infliction, under another name, of the punishment of transportation for the crime of poverty, i

order to free the land from the burthen of maintaining the pauper at home, connected as this new scheme of colonization was, and coincident in point of time, with a necessary but unpopular alteration in the system of administering relief under the poor law, and assailed, as that alteration was, by the agitation raised against it by demagogues and party writers, and by those who had battened on the abuses of the old system.

Our next step in colonization consisted of an attempt to found, in Western Australia, a colony by means of free labour alone, the labourers to be led out by capitalists, who were to be induced to emigrate by extensive grants of land. The result of this attempt shewed how much the prosperity of the old Australian colonies had been advanced by means of the convict labour at the disposal of the government for public works, and by the expenditure necessary for the support of the convict establishment. The firmness with which, under every disadvantage arising from the want of labour, the majority of the colonists resisted every proposal to introduce convicts among them, shews, at the same time, in the strongest possible light, how much the moral evil of a criminal population outweighs any pecuniary advantages to be derived from their compulsory labour. This colony, though making slow progress at present, is in a more healthy state than others to which the stimulus of land-jobbing has been applied; and when the market shall have absorbed the lavish grants made to the first settlers, which at present prevent the sale of the government lands and the introduction of a more abundant supply of labourers, it will advance with rapid strides. The descendants of the present generation of settlers will then bless the firmness of their fathers, which saved them from the contamination of a felon population.

The colonies more recently established in Southern Australia and New Zealand have been founded on an approximation to sound principles. An attempt has been made, by abolishing free grants of land, to concentrate the colonists, and, by applying the proceeds of the land sales to the introduction of free labour, to enable them to carry with them, to the land of their adoption, the comforts, and refinements, and gradations of society which belong to a high state of civilisation. The attempt has succeeded to a certain extent; but the intervention of joint-stock companies—the jobbing in land by those who never intended to set foot in the colony—the haste with which the emigrants were dispatched, in order to raise the value of the town allotments and the shares of the company, before habitations were prepared or lands surveyed—the speculation which, by giving a fictitious value to unreclaimed land, retarded cultivation—the consequent privations and disappointments which the emigrants endured—and the pains taken by rival colonies to depreciate each others

prospects, have tended but little to diminish the reluctance o the labouring classes to avail themselves of the means of improv ing their condition, which the colonies in reality hold out to th sober and industrious. The establishment of colonies by mea of penal settlements—by means of free labour, and free gran of land to individual capitalists—and by the sale of land and t intervention of joint-stock companies, have thus all been trie Of these the last appears to be the best, but far from acco plishing the end proposed. The plan of founding a colony which the government shall perform the office which the joi stock companies profess to perform—that of acting as pioneers the settler—has never yet been tried. He has hitherto been co pelled, on his arrival, to dissipate his resources while waiting the survey of his land; or, at the best, he has been set down the wilderness to struggle with difficulties which might have be avoided. If, instead of this, lands were offered for sale with small portion of them cleared and ready for cultivation, furnish with temporary habitations for the settler and his labourers, a with the conveniences of roads and public buildings, the price the land being increased by the amount of the government penditure for these purposes, there can be little doubt that emig tion would be rendered more attractive to all classes. The periment is, at any rate, worth making, at first, of course, on comparatively small scale—should it succeed, the operations mi easily be extended. But with the prevalent feeling among labouring classes in favour of home colonization, that ought to have a fair trial. Should it fulfil the sanguine expe tions which many entertain in its favour, the country will h no reason to regret the temporary advance of money which it require, and should it fail, the public mind will at any rate disabused of its prejudices, and prepared for the outlay of cap in the extension of our colonial empire. The two experime might be tried simultaneously, and ought to be tried speedily. large portion of the labour employed in the iron manufactur about to swell the numbers of our unemployed, with little p spect of a speedy revival of the trade from its present stat prostration. By a strange fatality, the stream of volunt emigration, owing to pecuniary embarrassments in our own c nies and in the United States, has become languid at the v time when the dearth of employment at home renders it de able that its current should be increased. It has already b stated that the number of emigrants from the United Kingd during the last eighteen years, has been, on the average, 62,(In 1841, they amounted to 118,502, and in 1842, to 128,: whereas, during the first quarter of 1843, there was a diminu of their numbers of 13,487, as compared with the correspon [illegible] of 84[illegible] This falling off has taken place, while, at P

ry, nearly 20,000 persons, or one-third of the population of the town, is supported by charitable contributions, while Stockport is in a nearly similar situation, while one-fourth of the hands employed in the cotton trade are either out of work or only partially employed, and while the surplus labourers of the rural districts, who had been induced to migrate to the seats of the manufactures, are thrown back again upon their parishes. Surely this is the time when the government might interfere, with advantage, to relieve the overburthened market for labour, by stimulating the cultivation of land both in the colonies and at home.

Let us consider how these objects may be effected, entering more into practical details than in some plans which have recently been brought before the public. Many a town which, upon a distant view, appears to the traveller a city of palaces, proves, on a nearer approach, to be but a collection of dilapidated hovels; and much as the remarks of the *John Bull* newspaper, quoted in the last number of this Journal, on the subject of emigration, are characterised by good feeling, the plan of colonization proposed instead of the present system appears to be one of those vague generalities which will not bear a closer inspection. It is all very well to talk about extending to emigrants all those aids and appliances which the national resources place at the disposal of our rulers—of conducting emigration with a due regard to a proper intermixture of the various orders of society—of encouraging capitalists personally to lead bodies of emigrants to distant lands—of tempting younger sons to expend their energies in laying the foundations of a yet more noble colonial empire—of introducing the refined as well as the more useful arts in due proportion—the question is as to the means by which all this can be accomplished. We must admit the propriety, not to say necessity, of securing to members of the Established Church the benefit of a due supply of bishops, with subordinate clergymen in fitting proportion, but it is much to be doubted whether the want of such a supply deters Presbyterians and members of the Church of Rome from seeking their fortunes in the colonies; and yet these would seem to be the classes among whom emigration appears at present to be most languid, if we may judge from the relative proportions of English, Scotch, and Irish emigrants, as exhibited in the official returns published by the Emigration Commissioners. The numbers for the year 1842 and first quarter of 1843 were—

	1842.	First Quarter of 1843.
From England, . .	74,683 .	3,999
... Scotland, . .	13,108 .	560
... Ireland, . .	40,553 .	229

If the plan of the writer of the article in the *John Bull* i to the objection of being deficient in details, the same ob applies to that which he proposes as a substitute for Mr Fe scheme of home colonization. It is a mere sketchy outlin

The labourers of England, (he tells us,) though unwilling to be culti colonial swamps for the benefit of schemers who remain at home, are wi eager to be furnished with the means of cultivating the waste lands of the country. Let food, shelter, and clothing, on a moderate scale, be provided during the period which must elapse before their labour can be rendered pr and the half-fed crowds who haunt our manufacturing towns will repair wit to the bleakest moors of England, from which their energies may suffice, ul to extract the means of independent subsistence.

Mr Ferrand's plan, though embodied in the form of a mentary bill, was scarcely more definite. The details we to the discretion of the parish vestry, subject to the fo directions:—

One-twentieth of the waste lands were to be reserved to the use of the ever, the remainder was to be allotted to the use of the poor—the d between the two uses is not very apparent—to be *divided into lots of such extent as should be deemed most useful, no man being apportioned less than a qu rood*; the fencing of the allotments and building of the cottages to be p the poor-rates, subject to the proviso that not more than threepence in tl should be applied to this purpose during any one year; the allotments to l for twenty-one years; the rents of the cottages to be the fair annual rent o in the parish; the waste lands to be rent-free for the first year, at half the the second year, and at a fair annual value for the third and every succeed These rents to be applied, first, to reimburse the expense of fencing and and, after that, to be paid to the poor-rate fund, which they were ulti supersede.

There are many serious objections to the connection reclaiming of waste lands, either in the colonies or at hom the machinery of poor-rates. Parish cottages and allotm waste, in lieu of parochial relief, had been tried, under th agement of the vestries, and churchwardens, and oversee had proved a failure, like many other expedients of these such as labour-rates and roundsmen. Parochial property kind, to a large amount, has been sold by the Poor La missioners; and no one who is at all conversant with th agement of such property by the parochial authorities, or t dition of the occupiers of it, would wish to see it restored

Neither does Mr Ferrand appear to have formed an conception how the occupants of these parochial allotmen to support themselves. Was the land to be their sole d ance, or was it to be subsidiary to the wages of labour for —and what was to be their employment?—were they to w manufacturers or for farmers? If for the former, there difficulty alluded to by Sir James Graham, which Mr F appears to have entirely overlooked, that around the ma turing towns—the great centres of population—there is much waste land. This, if there were no others, is a fatal

tion to any scheme for settling the unemployed operatives upon the land by means of the machinery of parochial management. The extension of the railway system will probably lead to the dispersion of our manufacturing establishments; so that large manufactories may have houses, with small portions of land, for the work-people attached to them. In Mr Chadwick's report on the sanatory condition of the labouring classes, several instances are given of such manufacturing establishments; and the advantage to the labourer of possessing a residence held of his employer, and in connection with his employment, is shewn in a very strong light. If the operatives of Manchester, instead of being crowded in filthy, ill-ventilated courts and alleys, inhabited comfortable cottages, surrounding the mill at which they worked, with gardens of a quarter or half an acre attached to them, the land would afford them a healthy and innocent recreation in the open air for their leisure hours, and would be something to fall back upon when a depression of trade put the factory hands upon short time. It would accustom them, too, to the cultivation of land, and would prevent their being utterly helpless, as they are at present, at anything but manufacturing labour. I could point to a large town, at the present moment, whose manufactures, from change of fashion, improvements of machinery in districts more conveniently situated with respect to a supply of coal, and a variety of other causes, have long been declining. The hand-loom weavers, thus thrown out of work, offer themselves as labourers in the construction of a railway in the vicinity, and are only laughed at; they apply to the farmers, and they will not employ them, because they have an abundant supply of labourers more capable of performing the work required by them. There is no chance of a revival in that department of manufacturing labour in which they are skilled, and they are not likely to acquire dexterity in any other. Emigration, or the cultivation of land on their own account, appears, therefore, their only resource; but they are not the description of labourers to be in request in a new colony; and in field-work of any kind, either in the colonies or at home, they will have a noviciate to go through, which would have been less severe had they, while manufacturers, had experience in the cultivation of a small portion of land during vacant hours. But such an arrangement of manufacturing establishments, with cottages and gardens for the work-people, must be left to time and the good feelings of the employers of the operatives, or their sense of its beneficial effects on their own interests. It cannot be made matter of legislative enactment, still less can it be brought about by means of the machinery of a parish vestry, as proposed by Mr Ferrand. If, however, he intended that the occupiers of these

allotments should depend entirely on them for their suppo
may be safely affirmed that his minimum of a quarter
rood ought to be multiplied by forty. In Ireland, the su
sion of land has been carried too far for the comfort c
tenantry, and there the average occupation is ten acres.
most successful cases of cottage allotment are under Mrs I
Gilbert, in Sussex; but they are held in connection with en
ment at daily wages. I have known an instance, in North V
where the surface of a mountain, covered with a deep supe
deposite belonging to the boulder formation, and having an
tion of 600 or 800 feet above the sea, worth, in its or
state, about 1s. an acre, as sheep-walk, was converted
small farms of from five to twenty acres, which produced
crops of oats, potatoes, and grass, the occupants of whicl
further, the advantage of grazing a few sheep on the cor
The enclosures were made by squatters; the first were
raged to do so by the parish, in order to relieve them
from the burthen of supporting them when out of work,
made encroachments without permission, till so much
common was enclosed that the landowners threatene
enclosure act, under which all encroachments, not twenty
old, would have been taken away from the occupants.
Welchmen, from the neighbourhood, established in Lo
interested themselves on behalf of the cotters; the L
press took up their cause, the Crown, as lord of the n
resisted the enclosure act, charged the encroachers quit-ren
thus took them under its protection, and eventually sold
their encroachments at seven years' purchase on their
that is, the value they had acquired by the labour c
squatters. But these people were all skilled labourers, w
in the neighbouring slate quarries, and earning from 12s. t
a-week, which was far higher than the wages of agric
labourers; and there can be no doubt that, if depending e
on the land, their condition would have been inferior to t
the labourers working for the small farmers. The rate of
sure always depended upon the demand for labour in the qu
When the slate-trade was brisk, the work of encroachmen
on briskly too; when it flagged, few cottages were buil
little land enclosed. There were no instances of such encl
being made by mere agricultural labourers. If we would
the real state of the occupier of a small farm, which im
tion pictures as one of comfort and happiness, we need onl
sult the picture of the condition of the small farmers of
Wales, at the present moment, as described in the colum
the *Times* newspaper—a great opponent of emigration sche
by "[illegible] reporter" sent down especially to inquire in

cause of the present disturbances there. "The class of labourers," he says, "as a class, does not increase in the agricultural districts of this country. The population, as to them, remains the same; for, when they become too thick upon the ground, they migrate to the mining districts and get work there. The farmers, on the contrary, from the mere operation and pressure of over-population, appear to be continually descending into the class of labourers. The following is the general and true picture of their career:—A respectable farmer, having held up his head in the world, till his family of two or three sons is grown up, is anxious to settle them. They speak only Welch, and understand very little English, and their education is such as they have gathered upon the farm and from hearing the parson preach. They are only fit for farmers or labourers, and that in Wales. The young men get married, and there is what is called a bidding at their wedding, which is a general subscription from all their friends, varying from 2s. 6d. to £1, to set them up in the world, and they are bound, in like manner, to assist the sons of those who have assisted them. A farmer's son will in this way realize from £50 to £100 to commence life with. The father then must get his son a farm; and, if one is to be let, the full rent demanded is given. The young farmer, commencing without sufficient capital, struggles on wretchedly for three or four years, to pay his rent and live, and at last is broken up, his stock sold for his rent and debts, and his farm taken from him, and eagerly taken by some other young farmer, commencing life in the same way, at the same or a higher rent. The ruined farmer then sinks into a labourer, and, povertystricken and brokenhearted, never again raises his head; or, if he has the energy to withstand his broken fortune, migrates to the mining districts, and strives to work his way up from the position of a labourer to a more respectable sphere. This, I am told, is the history of thousands."

The heavy rents which we are told grind down this class of farmers, and drive them into rebellion—rents which have been screwed up till they can be screwed no higher—"are, for land in the valleys, about one mile from the town of Llandovery, £1 an acre; and, on an average, for hill and valley, 10s. to 15s. The wages of labourers are 1s. 2d. a-day, or 7s. a-week, with a cottage, when employed by the landed proprietors; 6d. and 8d. per day, with food, when employed by the poor farmers. The size of the farms, we are elsewhere told, is from 50 to 100 acres; and the food of the prosperous farmer black barley bread and buttermilk, with, occasionally, salt meat. Now, were land of this description cultivated in farms of 500 or 1000 acres, partly arable and partly devoted to grazing, by farmers pos-

sessing adequate capital to stock them, and to improv
by underdraining and subsoiling, there can be no doul
would be able to do well at the above rents, and th
present race of farmers would be more comfortable
bourers, working for tenants of capital, and receiving
wages in kind, like the peasantry of Northumberland a
Lothians. It scarcely admits of a doubt that, could Mr Fe
plan be realized, the tenants of his parish allotments, dep
entirely on them, would be as little able to pay their rents
small farmers of South Wales. But, perhaps, it may be sai
though they would not succeed as tenant cultivators, the
live in comfort as cultivating proprietors; let us inquire,
fore, what is the minimum quantity of land which would
to support such a proprietor in independence and comfo
if there are any means by which those manufacturing ope
for whom there is no prospect of employment, as well as t
plus agricultural labourers, may be converted into small p
tors of portions of waste land. Here, again, the minimum
be stated at less than ten acres. Estimating the produce
quantity of land to be worth, at the present prices, £6 a
and allowing to the cultivator £5 of this, for his share as
occupier, and labourer, leaving only £1 for seed and otl
penses, such as tithe, rent charge, and poor-rates, the amou
be but £50. Let us compare this with the wages of a
servant in Berwickshire or Northumberland, working for a
farmer, and paid his wages, for the most part, in kind, so
to be affected by the fluctuations of prices. The value
grain, and cow's keep, &c., which he receives, together w
money wages, amounts, at the present prices, to £28 or £
which are to be added the earnings of the wife, and such cl
as are of an age to work. According to the statements
Gilly of Norham, we find these amounting, with the father's
to £46 : 14s., £48 : 8s., and £68. In the first instance, the
consisted of six children. The wife earned £3 in harve
daughter, aged nineteen, earned £9 : 4s. during the year,
son, of twelve, earned £5 : 10s. In the second case, ther
seven children—the wife was unable to work in the field
having a young child, one son, of fifteen, earned £10 :
daughter, of thirteen, earned £6, and a son, of eleven, £3.
third case, where the total amount was £68, there we
children, but the separate earnings of each member of the
are not stated.

But before our peasants' ten acres of land will yield a
able produce of £50 a-year, a large amount of labour m
expended upon it, independently of the ordinary labour of
cultivation. The *John Bull* newspaper proposes that '

ter, and clothing, on a moderate scale, shall be provided for ," during this period. Let us see what this will amount to. ere must be a road by which he can approach his allotment, must be fenced, a dwelling must be erected, the land must be ined and limed, and he will require a cow and a pig, seed, and sistence for a year, before his first crop will be available. We l not put a high value on the land in its unreclaimed state, ing the purchase of it only at £1 an acre, the same as the price of d in Australia. We will suppose the allotments laid out with a ntage to the road of five chains, or twenty perches, and a depth of enty chains, or eighty perches. One end and one side of each otment will thus require 100 perches of fencing; and on the o sides of a mile of road there will be thirty-two allotments. ith regard to the dwelling, we need only turn to Mr Chad-k's report on the sanatory condition of the labouring classes be convinced of the injury which their health and morals sus-n from inhabiting cottages with fewer than three sleeping ms, one sitting room, scullery, and pantry, or storeroom for visions. It appears, also, by the return from twenty-eight nties, that the expense of building such cottages varied ording to the kind of materials in use, and their cost, from l0 to £180. We shall not, therefore, overstate the expense of ilding such a house, with the addition of a small shed for ashing corn—barn we will not call it—with byre for two cows, £150. The following, therefore, will be the sum required to e the occupier of these ten acres a fair start:—

Purchase of waste land from the lord of the manor, and those having rights of common on it, ...	£10	0	0
Fencing 100 perches, at 5s., ...	25	0	0
One thirty-second part of a mile of road, at 10s. a-perch,	5	0	0
Building a four-roomed cottage, with outbuildings, .	150	0	0
Furrow-draining ten acres, at £8, . . .	80	0	0
Liming, at £3 : 10s., ...	35	0	0
Seed, implements, and subsistence for one year, (little enough,)	15	0	0
Cow and sow, ...	10	0	0
	£330	0	0

To establish 10,000 such occupiers, of ten acres each, would quire, therefore, the sum of £3,300,000. This sum the govern-nt might raise by loan, and apply it to this object, under the nagement of some existing board—the Tithe Commissioners, instance, or the Commissioners of Woods and Forests—in e same manner that the settlement of King William's Town s been established in Ireland, on some waste land belonging the Crown. The repayment of the sum advanced to and ex-nded for each settler might be made by annual instalments, ring thirty years, with interest at five per cent. on that part the principal remaining unpaid, the payment of principal and

interest to be commuted for the payment of an annual rent, during thirty years; at the end of which period the occupier or his heirs would become the owner of the premises in fee. The annual payment for each allotment would, at this rate, be £21 : 9s., leaving the cultivator a disposable income, till the property should become his own, of only about £28 a-year, or produce to that value, in return for the labour of himself and all his family. Long, however, before he became a freeholder, there would be a fresh swarm from the hive, wanting either employment as manufacturing or agricultural labourers, or assistance to establish themselves on another piece of waste.

It would be impossible to place the cultivation of land in such small patches on more favourable terms for the cultivator; and if he did not succeed, with such assistance, in establishing himself as a small proprietor, it is quite clear that he would not be able to support himself by cultivating a smaller allotment as a tenant to the parish, as proposed by Mr Ferrand. The only prospect of success would arise from increasing the extent of the land, and making him a small farmer, cultivating his own land and employing labour.

Let us now inquire what a similar sum of money would effect in settling a portion of our redundant population in Canada, selecting that colony on account of its contiguity, notwithstanding the impediments which have been thrown in the way of an extensive and systematic plan of colonization, by the lavish grants of lands which have been made to individuals, and which remain in a wild state, unprofitable to their owners, and obstructing the advance of the colony. The proceeds of the land sales there, moreover, have been ceded to the provincial government. It would, therefore, be necessary to purchase a tract of land, for the experiment, from some of these proprietors, or to pay the colonial government at the established price, which, in Upper Canada where we will suppose the experiment to be made, is 6s. 7d. sterling per acre. An extensive tract of land having been thus obtained, we will suppose a road to be formed through it, and farms of 200 acres laid out on each side of it, with a frontage of a quarter of a mile. There will, therefore, be eight such allotments to the mile; and charging on each £25 for the expense of clearing and forming a road ten yards wide, we shall have £200 a-mile for this purpose. The following will then be the sum required to establish a settler on one of these farms, according to the prices stated in the colonization circular:—

Passage of a man, his wife, and three children to Quebec,	£17	10	0
Journey to Upper Canada. . . .	4	15	0
Carry forward, . .	£22	5	0

Brought forward		£22 5 0
Purchase of 200 acres, at 6s. 7d. sterling,		65 16 8
Clearing five acres, at £3,		15 0 0
Proportional share of the expense of road,		25 0 0
Implements—		
One plough,	£2 8 7	
Two harrows,	3 14 0	
One cart,	8 5 0	
		14 7 7
Live stock—		
Two cows,	£10 9 2	
One sow,	1 13 10	
One yoke of oxen,	17 13 3	
		29 15 3
Seed and sundries,		12 15 4
Provisions for one year,		25 0 0
		£210 0 0

.t this rate, the establishment of 18,000 families in Canada ld require the sum of £3,780,000, making, with the expense of blishing 10,000 families on the waste lands at home, a total ?7,080,000, by which the labour market would be relieved of 00 families, or, allowing five to a family, 140,000 individuals. posing voluntary emigration still to continue at the average of 63,000 a-year, the 140,000 emigrants and home colonists, led on the land, by means of advances from the government, ld still leave an annual increase of 80,000 people, who would bliged to seek employment of some kind or other for themes. While, therefore, the labouring classes could not fail to enefited by the removal of so many competitors, the employof labour, whether in manufactures or agriculture, would not er from any great and sudden advance in the rate of wages the consequence. One beneficial effect resulting from this enditure would be the diversion, into our own colonies, of a ion, at least, of those emigrants who have hitherto left this ntry for the United States. Of the 128,344, who emigrated 842, it appears, by the official returns, that 63,852 went to States. Of these more than 6,000, from want of employt there, are estimated, by the chief agent of emigrants at bec, to have passed into Canada, and nearly 10,000 returned England, from the same cause, from New York alone. Of annual number of emigrants during the last eighteen years, may safely calculate that half, or full 30,000, have gone to the ted States ; for, though the process has latterly been reversed, y of those entered as emigrants to Canada have only passed ugh it on their way to the States. Surely it is worth while nake some attempt to turn our surplus population into our colonies, instead of sending them to swell the strength of a l, and sometimes hostile, nation. Is it probable that the rnment would find any difficulty in raising a loan of £7,000,000

for the purposes proposed? Would not such a loan, on the contrary, be hailed with delight in the money market, as affording an investment for capital, which, ere long, for want of employment, will be seeking a vent in all kinds of bubble speculations at home and abroad? Hitherto we have not only supplied the United States with an annual draft from our population, but with money to employ them, as some of our capitalists know to their cost. Why not bring both to bear upon the more fertile soil of our own colony? Is it likely that Parliament would hesitate for an instant to guarantee the interest of such a loan, for the relief of our distressed labouring population, when they voted nearly thrice that sum to purchase the freedom of our negro slaves! Even should the proposed experiment fail, of which there is not the shadow of a chance, would it affect the national resources in any serious degree; and can the risk of such a sum be put in comparison with that of a servile war, to which the pressure on the working-classes, unless relieved, will infallibly lead? But the whole of the above sum would not be required to establish 28,000 families upon the land at home and abroad; and what was required would not be wanted all at once. In the first place, it ought to be made one condition, in affording assistance, that the party assisted should possess some means of his own. These loans to parties disposed to purchase waste land at home, or in the colonies, ought not to be held out as relief to the indigent, but as an encouragement to the provident workman, which is just the reverse of any scheme of colonization, or reclaiming of waste land at home, by means of the machinery of the poor law. Offering, therefore, to the labourer his choice of establishing himself on ten acres of land at home or on two hundred in Canada, we should require the applicants to lodge with the commissioners, in the first case £30, in the latter £50, to be returned to them when established on their allotments. The first sum is rather more than the estimated amount for live stock, seed, and food, during the first year—the other is about the amount of the cost of removal to Canada, and of provisions for a year. This would reduce our £7,080,000 to £5,880,000. By enforcing this deposite, we should assist, directly, not the pauper, but the provident labourer, who had saved a little money; or those who, being without resources themselves, would be enabled, by their personal character, to obtain aid in the way of gift or loan, either from friends or their landlords, to enable them to emigrate. The removal of a number of labourers of this description would enable those now out of work, and subsisting either on the poor-rates or charitable contributions, to succeed to their vacant places. Another class who would avail themselves of this assistance to emigrate would consist of those who, compelled

y the vicissitudes of the times, to descend in the scale of society are, have saved enough from the wreck to enable them, with ich aid, to establish themselves as small landowners in Canada.

A year, moreover, would elapse, after operations had commenced, before many settlers could be located either here or in e colony. The first step to be taken at home would be the ying out of the allotments by an engineer, and the completion the roads, fences, buildings, and drains, by hired labourers der his direction, so that the settler would have nothing to do and in this he would have occupation enough—but to commence the labour required for the ordinary cultivation of his id. These preliminary operations would occupy a year, and ir cost would amount to about £2,700,000, out of the ,300,000 which it is proposed to apply to the experiment of me colonization. In Canada, in the same manner, a year uld be occupied in preliminary operations, carried on by the gineering staff and hired labourers, before the land would be dy for the reception of the emigrants. The purchase of a ct of land containing 4,000,000 acres would come to about .,370,000, but arrangements might easily be made with the onial government, or the proprietors of old grants of wild land, the payment of the money by annual instalments, or by detures bearing no interest, as proposed by Mr Buller. The parations, by partial clearing and forming roads for the locan of 18,000 families, would cost, at the estimate before given, '20,000, and would occupy nearly 15,000 labourers for a year. e great fault of the colonies founded by the joint-stock comies has been, that there was not sufficient time allowed to pse between the departure of the surveying staff and that of emigrants. The engineer ought to commence the operation, selecting a suitable spot for a town, as conveniently situated possible to a settled district, whence provisions could be drawn so large a body of workmen; and the number with whom he uld commence should be regulated by the prospect of obtain; a supply of provisions with facility. Here he would clear a ce and erect habitations for the workmen; and from this, as centre of operations, he would cut roads in various directions, ing out allotments by the side of them, and clearing five acres each. Round the town he would reserve sufficient space for future increment. The expenditure of so much money would sure to attract settlers from the neighbourhood, to establish ps for the supply of the workmen; and town allotments would in request. These the colonization farmers would sell, from e to time, as there appeared a demand for them, by public npetition, expending the proceeds in the construction of ools, places of worship, market houses, and other public struc-

tures, which would render the locality attractive to colonists. Small capitalists would now resort to it from England, who would become employers of labour. To these small capitalists the commissioners would probably be able at once to sell these partially cleared allotments, at such a price as would cover their outlay in the original purchase, clearing, road-making, &c., particularly if the purchase money were allowed to be paid by instalments, thus allowing the colonists to apply all their own resources to the reclaiming of their grants. The workmen employed in clearing under the engineer, would, in the course of a few years, save money enough to become purchasers themselves, and labourers would be wanted to supply their places. From the small expense attending the passage to America, a large portion of our voluntary emigration flows thither, and thus, the mere fact being known that the government intended to keep a certain number of labourers employed in the pioneering operations we have proposed, would produce a rush of twice or thrice the number to the point. The expenditure of this amount of capital would in the same way attract, as we said, a number of settlers possessed of sufficient means of their own to become purchasers of the lands prepared for them, and to employ labour in clearing them; so that, perhaps, all the encouragement which it would be necessary for the government to hold out, in order to induce the settlement of 18,000 or 20,000 families in Canada, would be the employment of 5,000 or 10,000 men, at an expenditure of from £250,000 to £500,000 a-year, allowing each man to earn £50, exclusive of that of the engineering staff and the cost of purchase of the land. It follows, from the preceding estimate, that such an expenditure, for the promotion of colonization in Canada, would do more to relieve the over-burthened labour market, and would be productive of more benefit to the labouring classes and small capitalists, than the application of the same sum to the formation of cottage allotments upon waste lands at home. I have merely advocated the bringing of the latter to the test of experiment, in consequence of the popular prejudice prevailing in its favour, and because of the urgent necessity which exists for finding, as speedily as possible, employment for the numbers who are at present out of work, and because of the delay which must arise before any extensive plan of colonization in Canada can be brought into action. The scale of operations proposed for such colonization, though the smallest that would afford any effectual relief, is more extensive than it would be prudent to commence with, until accommodation was prepared for the requisite number of labourers, and a certainty secured of a supply of provisions.

REMARKS ON THE REPORT ON THE EMPLOYMENT OF WOMEN AND CHILDREN IN AGRICULTURE.*

Towards the end of last year, the Poor-Law Commissioners eived instructions from Sir James Graham, as Secretary for Home Department, to appoint four assistants for a limited e, whose duties would be to inquire specially into the employnt of women and children in agriculture, and the effects of t employment on their health and morality. In obedience to se instructions, four gentlemen were selected for this purpose, of them barristers-at-law. To Mr Vaughan was allotted nt, Surry, and Sussex; to Mr Alfred Austin, Wilts, Dorset, von, and Somerset; to Mr Stephen Denison, Suffolk, Norfolk, l Lincolnshire; and to Sir Francis Doyle, Yorkshire and rthumberland. The volume before us is a report of their ours.

In giving them their instructions, they were told that, "the ject of your inquiry being the employment of women and ldren in agriculture, the commissioners request that you will mine into the sorts of labour at which they are respectively ployed, the wages which they receive, the hours of work, and other similar facts which may tend to throw light upon their sical and moral condition. The commissioners desire that r main attention should be directed to the employment of ldren; and that you will particularly inquire into the ages at ich they begin to work, and the effects which their occupation labour may produce upon their bodily health, as well as upon ir opportunities for obtaining school instruction, and moral l religious education. The commissioners likewise wish that should inquire into the condition of the children of agricultal labourers, who may have been apprenticed by the parish cers, in the parts of the country which you may examine."

First, then, of the sorts of agricultural labour in which women engaged, as reported by those four intelligent gentlemen. ese are—working in the hay and corn harvests, or in the dairy; ing turnips, weeding, and picking stones, planting and digging tatoes; pulling, digging, and hacking turnips; attending the ashing machine and winnowing corn; beating manure, ing dung carts, and planting beans. These occupations seem nmon, from the reports, to all the counties—picking apples is fined to the cider counties; employment in the hop gardens others; and leading horses to the plough—a practice still nmon in remote parts of Devonshire, Somersetshire, and other ts.

* 8vo, pp. 378. Clowes & Sons, Her Majesty's Stationery Office.

Secondly—A report is given of the wages of women, which of course, vary in particular circumstances, seasons, and situ ations, to the extent of from a penny to even fourpence a-day. The average rate is from sevenpence to ninepence; but during potato harvest, where the work done is great and th labour heavy, it is not uncommon that even a shilling per day i paid to the women.

Thirdly—The hours during which women work were, gene rally speaking, found to be from eight o'clock in the morning during winter, till four o'clock in the afternoon. At other sea sons they are engaged from eight morning till six evening, o from half-past seven till half-past five. In hay harvest th hours are from six morning till six evening. In the middle o the day an hour is taken for dinner.

Mr Austin found that the severest labour performed in con nection with agriculture by women is in the dairy-farms; th work lasting during the principal part of the year, and for man months occupying the greater portion of the day. Milking an making cheese, twice a-day, seems like the rolling up of the ston of Sisyphus—work that is never finished; more especially whe added to these are the constant wiping and cleansing of the ne cheeses. The heaviest work, however, in the dairy-farms, gene ally falls, not upon the female servants, but upon the farmer' wife, or—if he is so unfortunate as not to have one—on th dairy-woman who acts in her place, as not only the responsibilit but most of the actual labour—as the attending to and preserv ing the cheeses—rests with these officials.

So much for the out-of-doors agricultural employment of th women. With regard to boys and girls, the former begin t work at nine or ten, the latter seldom earlier than twelve, an not even generally till after the age of puberty. When emplo ed at an earlier age, it is only in occasional assistance at the ha harvest, or in planting and picking potatoes, or other light worl Sometimes a hard-working well-behaved labourer may endeavou to add to the family support by getting even earlier employmen for his children from his master; but this is done either fro the idea that these children may thus be earlier made to becom useful, or from the kind feeling of preventing the parents bein obliged by poverty, when the little ones are numerous, havin them sent to the poor-house. The age at which work commenc was also found to depend in a great degree upon local custon and casual circumstances—as the absence or presence of a goo school.

When boys are put out so young as eight or nine, it is gene ally in bird-scaring, taking care of poultry, carrying wood fo fuel or other light tasks; but strong boys, at ten or eleven, lea

horses to the plough, are occupied in the hay or harvest field, and do the numerous little jobs necessary about the farm house or yard. At fourteen or fifteen a lad begins to hold the plough and attend to the stable, also to help the carter, and, occasionally, to drive the team. After that time he commences mowing, reaping, hedging and ditching, and the other more operose and difficult farm occupations.

The hours during which boys are occupied during the day are generally the same as those of men—being from eight morning till four afternoon, or from six A.M. to six P.M. In hay or corn harvest they are occasionally longer employed, on account of the weather, or other circumstances. The wages of the youngest boys are generally eighteenpence a-week; and at twelve the average was found to be from half-a-crown to three shillings.

Females are employed in field work from the ages of fifteen to twenty, sometimes more than the latter, but seldom earlier than the former, arising, in a great measure, from the laudable desire of their parents to get them into domestic service. Hence it is that it will be found that the majority of regular workers in the fields are above thirty years of age, and generally married or widows. The average of wages, as has been said, is from sevenpence to tenpence a-day. Women work in winter from eight in the morning till four in the afternoon; in hay-harvest their labour extends from six to six, an hour at mid-day being allowed for dinner, and two or three other short intervals of rest during the day. As to the effects of agricultural labour on the health of men and boys, we really think the subject too absurd for serious discussion, unless we previously make up our minds that the wheels of society may be safely allowed to lie still, and each one entitled to say to his neighbour, "A little more sleep, a little more slumber, a little more folding of the hands to sleep," and it was agreed that all human labour might be pleasantly dispensed with. The reports before us give exactly the conclusions which could not fail to follow such an investigation.

Mr Austin arrives at the following deductions, after a short but most assiduous and thorough scrutiny of the subject:—

The effects of out-door farm labour upon grown-up women appears, on the whole, to be beneficial. Women accustomed to it, nearly without exception, represent it as good for their health and spirits. He did not meet with an instance of a woman complaining of the effects of working in the fields on her health. Sometimes such work, particularly in the hay and harvest seasons, was represented, by those who performed it, as being laborious, as making them stiff at first, or even as straining them; but he did not find that any woman, from her own statement, had become subject to any permanent disease or infirmity from the

employment in question. As far, therefore, as the testimony of the women themselves is concerned, and which is not to be disregarded, [we say emphatically, "most assuredly not,"] it appears that out-door labour is not injurious to their health.*

The medical evidence is nearly as uniformly favourable as that of the workers themselves; although two or three of the doctors make some minute qualifications, which may be safely applied to any other employment whatever under the sun; even these, however, are more than counterbalanced by the declaration of others, who affirm, and with truth, "that they have found much more disease in women of sedentary habits of the same class, such as those employed in button-making and household service, exercise in the open air, under proper limitations, rendering people less susceptible of the morbid effects of atmospheric changes."

But why, it may be asked by some pseudo-philanthropists, are women or children allowed to work at all? Women were surely only destined for household offices, and childhood should be a scene of repose and enjoyment, not of labour. Nothing, probably, more true, were it practicable that such things could be so. But, alas! *sæva necessitas* is no regarder of axioms; and the dread alternative is, "work or want." Well does Mr Austin say—

> There are cases of widows, and rarer ones of single women, with or without children, living by themselves, and wholly or partly dependant on their own earnings for support. But, generally speaking, the wages of women must not be considered as earned for, or applied in, their own separate support, but as a part of the aggregate earnings of a family, and, accordingly, part of the common fund for its maintenance. The condition of a woman employed in agriculture, therefore, does not depend directly on the amount of her own earnings, but of those of the entire family. She is not well or badly off, well or badly fed, clothed, and lodged, according to *her* earnings, except in a rare case of her being entirely independent of any other means of support than her own labour. The condition of women working in agricultural labour, therefore, depends upon the general means of living of the labourer; and, without an inquiry into this extensive and difficult subject, it is clear that their physical condition cannot be properly understood.

We come now to say a few words on the effects of field work on the morality of females; as this also has been a theme of discussion among parties much more distinguished for their good intentions than for their general judgment. Mr Austin emphatically says—

> Employment in field labour is beneficial to the physical condition of women. *The immorality observable among women so employed is not a consequence of their occupation*, but is the necessary result of the ignorance and poverty of the agricultural labouring population generally. *All direct interference in the employment of women in agriculture must be deprecated at present.*

What says his colleague, Mr Vaughan—

> The effect of labour upon the moral character of females is not such, in the ordinary course of agriculture, as to call for peculiar attention. *It is not an uncommon occupation for single women whose characters for chastity are blemished; but such a taint, where it exists, is less the effect than the cause of their employment.*

* These are Mr Austin's *ipsissima verba*.

)enison, the third commissioner who reports, gives a tes- . it must be allowed, much more guarded than the two ng; but we humbly opine that he deals too much on larities—as is evident from the conflicting opinions of those rs to. We would have liked much better had he ven- pon his own.

he effect of field work on the manners and conduct of women, (he says,) I ent opinions. *Some persons* deprecate it altogether, as tending to uncivilize ralize them, from their being thrown so much into coarse male society, [this the clowns!] *some think it harmless to married women*, though *very injurious to teen and upwards; some think it a good preliminary education* for all those probably become wives of labouring men, and have to train up a labouring nily.

some here appear to be people of the most opposite opi- and are probably like the two knights who engaged in , the one declaring that a shield was black, and the other was white, when the truth was that each had seen only its sides. But who shall decide when such doctors dis- Truth seems indeed to lie at the bottom of a well, and it require *some* trouble to fetch her up.

last of the *quartette*, Sir F. H. Doyle, distinctly speaks out oboration of the opinions and evidence of the two former colleagues; and he comes to this conclusion from the ractical and safe of all plans—*tabular results.*

regard to the manners and morals of the women, the tables above inserted, Francis,) will have shewn that no particular evil is supposed to result from ouring in the fields. It is against the glovemakers and dressmakers, as a t charges of unsteadiness are made. *One or two gentlemen think* that the nes of harvest tempt somewhat to levity—others that women much em- out-door work are disagreeably rough and rude in their manners; but shire women, generally, do not seem to be unchaste, nor do the turnip- d corn-weeders fear a comparison in this respect with those who earn their what may be thought more feminine occupations.

do not intend farther to refer to these very able and judi- reports. They completely answer the purpose which they tended to do, that is, to examine whether the employment en and children in agriculture was prejudicial or otherwise ral character, and they unequivocally evidence that it is

s clearly shewn that the general condition of a peasant's is much benefited by the weekly increase of their trea- the earnings of the females and boys being occasionally to those of the chief breadwinner—the father and husband. l systems, however good, are liable to abuse, and great care be taken, on the part of the farmers, not to press matters naterially to interfere with the education and school attend- f the young, as thereby they are, even selfishly speaking, aging an evil which, in the shape of criminality and ignor- n the part of the employed, will and must come eventually

to burst on their own heads. Labour, in one form or another, is the inevitable lot of ninety, at least, out of every hundred human beings who reach the years of maturity; and philanthropy cannot in any way be better exerted than in freeing it as much as possible, in all its Protean shapes, from vice and immorality. The factory system, fearful as at present it now seems, can only be properly judged of by its effects on a succeeding generation. Enough has been already elicited in Owenism, and Chartism, and female profligacy, to shew how difficult legislation becomes when we have destitution and starvation on the one hand, and ignorance and moral degradation on the other—how almost impossible it is to combine compulsory education with voluntary employment.

In connection with rural morality, there is a subject of great interest, and which cannot be sufficiently pressed upon the attention of all landlords and tenants—it is the securing of better domestic accommodation for their workers. What is the contamination out of doors, where it may at least be shunned by all who dread it, to the necessary contamination within doors, which cannot be escaped, where numbers of either sex are crowded into one, or, at most, two sleeping apartments—and where health is injured, while decency is outraged. We delight to know that, within the last ten years, much has been done, and is doing, to remedy this crying neglect; and that, in the keeping and ornamenting these improved cottages, a spirit of generous emulation and rivalry has been excited among the peasantry themselves. We can now point with pride and pleasure to whole villages in many districts, where not a trace of the old Scottish opprobrium—want of cleanliness—can be pointed out; but where, on the contrary, every symptom of improving taste, and even an effort after ornament, may be discerned both without doors and within.

We remember a distinguished agriculturist, who made a point of giving field employment to all the boys and girls belonging to his numerous farm-servants, whenever they reached the years of eleven or twelve; but he made two provisions in their engagement, which were—that the forenoon of every day should be devoted to their school instructions—and that they should regularly appear in the parish church on Sunday, where his grieve or overseer took down the names of such as were absent; repetitions of the offence, without an adequate apology, being considered as a sufficient ground for dismissal. This rarely happened; the interest of the parent being mixed up with that of the child to prevent its occurrence.

ew pages of this Journal were devoted to this subject, sequently, our pen has not been idle, where an oppor- vas presented, to prove that, as, from their position ordinary course of cultivation, farmers require and pos- tore of manure, and of other decomposable substances, xtricate a great volume of heat, they might so apply it nder it of threefold value to the land, and to the general c economy of the establishment.

is, a dunghill, or mixen, is nothing more than a mass of ing materials exposed, in waste places, to the air for ionths, wherein its heat and developed gases are lost for e, while the liquid drainage is absorbed and rendered per- navailable for the purposes to which it is best adapted. in one sense, is man's best friend; for the gases received atmosphere are therein stored, or so laborated, as to be d to the earth in showers which nourish while they vegetation; but, nevertheless, man is not true to himself neglects to improve any one of his resources.

cultivation of garden vegetables is not usually treated of gricultural periodical, but the subject, with strict limita- not irrelevant when it can be made to coincide with the tory duties of the farm. Such is the case in the instance now prepared to notice.

y ten years have elapsed since attention was first excited rse of routine in the melon department of a large garden d to the management of a person who has reputably re- is situation during twice that period. The machinery d in the course may be described in a very few lines. A

the mass, from time to time, till it was rendered compact; it then formed a gentle hot-bed, which (as there was a double range of pits) was used in one instance to grow a set of pine-apple plants, and in another to excite a crop of young potatoes, a quantity of loam being, in the latter case, spread over the leaves after their heat had much moderated. In the meantime, other masses of leaves—the fresher the better—were used as linings to pits, or as hot-beds under frames; and these, collected in autumn, annually, become sufficiently prepared and decomposed, to all intents and purposes, in six or nine months, for the future subjects of the routine.

After the early potatoes, the loam was stirred and intermixed with the leaves below to the depth of a full spit, and a fresh quantity of semidecayed leaves, that were prepared during the winter and spring, was laid as a deep hill or ridge under each light. The melon plants for the late crops being ready, one for every hill was planted in its centre, being transferred with an entire ball of roots from its pot, and watered just to settle the soil about them. This planting would take place late in June or early in July.

The lights were closed day and night, and shaded with mats, till the plants were perfectly established and began to grow; but no artificial heat was employed. This was the introductory course of the first season.

We have lately inspected the progress of melons in these pits wherein the lower and now perfectly decayed leaf-soil has never been disturbed for ten years, and have seen the roots wander through the entire substance of the new ridges put on in June. It does not appear that the old-leaf mould is appropriate to the melon, but it forms a mass, and elevates the new ridge toward the glass, a circumstance of moment in melon growing, though, at the same time, it must be insisted on that the new semidecayed leaves, gathered in the preceding autumn, form the pabulum of the melon plants, and a medium more congenial than loam and turf of any kind.

Writers are much in the habit of directing the application of strong maiden loam, and, doubtless, the melon has thriven therein; but it is equally true that many failures have occurred, and plants are seen to lie torpid for weeks in loam, whereas they start off at once, retain a rich and intense verdure, and bear much fruit of very large size, in leaf mould. Melons cease to bear in September, and then the beds are cleared with all dispatch to receive another crop, the preparation for which consists in levelling the ridges, laying over the surface a coating of decayed spit dung, reduced almost to the condition of *humus*, and forking the whole together to produce a pulverized homogeneous bed, in which strawberry plants are set by trowel, six inches apart, in rows (running from

to front) twelve inches asunder. These plants are obtained r by the runners of July, pegged down close to the strongest tlet, so that it may take root immediately, and come up with mplete ball in September; or, better, by plunging the small-pots, (size 60,) filled with light loam, and fastening the run-plant upon its surface. These pots are carefully attended to watering, &c., till they become filled with roots, when the nts and balls are transferred to others of a larger size, the soil which is enriched by adding one-third of mellow dung. This de of raising strawberry plants is certain, but gardeners find take up too much time; for the amateur, however, and the mer who can spare a hand for the work, it is admirable. The st variety of strawberry is the true Keen's seedling, its fruit aring heat extremely well, and being heavier, bulk for bulk, an that of any other sort, unless we may except (not yet, how-ver, sufficiently proved) the *British Queen.*

The strawberries being planted and watered, the sashes are losed, and kept close for some days, till the roots lay firm hold f the soil; when air is given by degrees, and, at length, before he frost sets in, the sashes are removed, and the plants exposed o the air, by which they not only are fortified, but brought into state of rest. But, on the approach of vigorous weather, the ashes are put on, and kept closed every night, though air is iven by day when there is no falling weather.

After turn of days, and as the power of the sun increases, air nd light waterings are given to prepare for the growth, which lever fails to commence many weeks ere strawberries in the best pen ground give any signs of vegetation.

When the runners protrude, they are removed, and every care aken to promote strong growth, without permitting vegetation o become rank by "drawing," as it is called, through want of ir.

The crops thus produced are amazing. We have known 400 ounces to be gathered in April, under a few lights, and sold to a collector of fruit—who, of course, would purchase cheaply—for £10, money down. The strawberry plants impart some loam to the bed; but this is digged into the leaf-mould beneath, after the fruit is gathered, when the plants are either destroyed or moved to some plot in the garden where it is intended to make a fresh plantation.

There is a considerable demand for this fruit in the neighbour-hood of great towns, about the month of April, five or six weeks before the time when they ripen in the open air; and, near Lon-don, persons make a business of calling at gentlemen's gardens to collect fruit through the season. For strawberries they pay from 9d. to 4d. per ounce; gather the fruit, pay for, and take

it away without any trouble to the grower. In the meantime, the public pay, in the shops, from 10s. 6d. to 1s. 6d. per ounce. An amazing difference, which, however, is of no avail to the grower, who, were he to apply to the great fruit-shops, would receive very little extra remuneration though he were obliged to incur the entire trouble and risk of conveyance.

Most persons force strawberries in pots—hence the supply is limited; but were pits adopted, the plants would be abundantly more productive, and the pits always in requisition for successive crops, which may be rendered profitable to a greater or less extent. In the establishment which we have taken as a model, the crop after strawberries continues to be late melons, prepared for annually by the leaves collected in the preceding autumn.

There are two or three objects of moment to be considered. The first is a range of pits, say of twelve lights, divided by a four-inch brick wall into three departments, which may provide every sort of vegetable or fruit which a farm could require, early and late, by aid of the dung at hand, which might be timely and advantageously heaped at back, and, indeed, round the erection, while, by a simple contrivance, the liquid drainage could be made to pass into a cemented tank furnished with a pump. Experience, and the object in view, must regulate the heat to be applied; but whether the manure were hot or cold, it might be profitably deposited around the walls. Farmers, therefore, possess appliances which the gardener is frequently obliged to purchase at high prices. Second, leaves of trees, reduced to that condition wherein they become brown, moist, adhesive masses, are so congenial to the roots of the melon, that it is no uncommon thing to see them trace ten or more feet in length, sending forth laterals even to the surface in every direction.

Black perfectly reduced *leaf-mould* is one of the purest conditions of vegetable aliment; in it the strawberry revels; but for the melon the hill or superstratum must be renewed yearly.

In a pit of three divisions, early potatoes may be substituted, in one of them, for strawberries, and be off in due time for late melons. Early melons can be raised by warm linings applied in March, and *cucumbers* at any season of the year.

In the garden referred to, the same soil has remained in one large pit for ten or more years; and never have we seen fruit produced in greater abundance or of finer quality than in that department. Why then should a farm be destitute of an appendage which it is calculated to support in a style altogether superior?

We have of late years heard a good deal concerning diseases and failure of potatoes; and in the present season mention is

e of blanks in the rows. We have proved, and so have many ers, that a blank is no proof of a failure; as, from some cause, ulmless potato may furnish a numerous and fine progeny of ers. This circumstance will serve as an introduction to an eriment upon the production of very early potatoes, which, ning from the pen of the late Mr Knight, in a private letter, ted June 12, 1832, may be much appreciated, and certainly ll not be irrelevant to our subject. He wrote thus—

"I collect the largest of my early potatoes so soon as ripe, in e end of July, and lay them close to each other upon the round, covering them about two inches thick with mould. hus circumstanced, they vegetate in the autumn; and if the oung shoots then produced be taken off, and the tubers preerved, *they generally will not produce foliage*, but will immeditely generate tubers. These will ripen more or less early in pring, in proportion as the tubers are kept more or less warm; nd it will be easily practicable to obtain young potatoes of xceedingly good quality during the months of May and June. There will always be a period of considerable length between the eriod of the tubers having acquired their growth, and subseuently becoming *excitable*, and during that period they are very ood. Under favourable circumstances, *three bushels* of old tubers will afford about *one* of new at this period, (May and June.) Now, as I can certainly raise, and am doing it, 600 bushels and upwards on the acre, the produce of half an acre of such potatoes in young tubers, if sold, must be a very profitable crop."

This process had previously been communicated to the Horticultural Society of London, and it proves that, if, by accident or design, a first development of shoots be removed, and the tubers then remain for some weeks out of ground, they will be very likely to produce a new crop of tubers within the soil, without exhibiting any appearance of external vegetation.

Whitfield Farm.—In Mr Trimmer's very able paper on agriculture and political economy in last number of this Journal, p. 20, that gentleman gives a very interesting account of the improvements of Whitfield farm, belonging to Lord Ducie, under the direction of the well-known Mr Morton, than whom there is not a more talented agriculturist in the kingdom. From the description of the farm, before the improvements were commenced, it appears to have been rather a portion of an ancient forest than a regularly cleared and enclosed farm; it was chiefly old pasture, with an inconsiderable portion of badly-managed arable land; it had been let as a dairy farm at a rent of £200 per annum, the tithe and parochial taxes £65, the annual expenses of cultivation £170, and the returns for wheat, cheese, &c., £463, which,

when all charges were deducted, left the tenant little more than £28 for his time, skill, and capital! The farm was taken into hand by his Lordship, to be managed by Mr Morton, junior, as an example farm, for the purpose of introducing an improved system of farming among the tenantry in the neighbourhood.

The improvements were planned and carried out on a most expensive and magnificent scale. The timber felled amounted to and sold for above £3,000, grubbing up old hedges, planting new, draining, subsoil-ploughing, levelling, making new roads and bridges, together with new buildings of every description, cost altogether not much less than £8,000; and, notwithstanding this formidable outlay on so small a portion of Lord Ducie's estate, there is well-founded expectations that, from the great additional produce and increased numbers of profitable live stock which that produce will continue to support, an ample return will ultimately accrue to both landlord and tenant. This is a most encouraging result to all capitalists who may be inclined to speculate in the improvement of waste, unproductive, or mismanaged land; for, though much of the success of the improvements in the present case may be attributable to the judicious measures pursued by the able and experienced conductor, yet there can be no doubt but that, wherever there is land of similar character, and requiring similar expedients of amelioration, such as draining, trenching, or trench-ploughing, liming, &c., similar results will certainly follow.

I have said land of similar character, namely, ancient forest land; because no portion of waste or non-arable land is half so well adapted for the growth of cereals or other agricultural plants as old pasture and woodland. Indeed, it may safely be asserted that, if Mr Morton had chosen an equal portion of the estate which had been for ages under the plough, and had bestowed upon it every operation executed at Whitfield, he would not have been more successful nor brought out such astonishing results as were realized at the last named place in the space of only three years; for it must be considered that the surface was everywhere clothed with a thick turf, enriched, for centuries perhaps, not only with the droppings from all sorts of cattle, but by the annual fall of leaves from trees, and from the decayed roots and branches of the same. It had not been exhausted of that *humus* or of those peculiar qualities so necessary for the luxuriant growth of corn, clover, and other green crops or roots; and the store of vegetable food being excited by the dressing of lime, all combined to render the first crops on the fresh compounded soil pre-eminently exuberant. This clearly appears from Mr Morton's report of two 10 acre fields which averaged 5 quarters 1 bushel and 5 quarters 6 bushels, respectively; and some of the land

uld have been more productive, but for the great burden of aw, equal to 1000 sheaves per acre, 30 inches in circumference d 4 feet long. Now this, together with the other abundant ops of roots, &c., may naturally be attributed to the very perct and expensive style in which the improvements were exeuted, and, no doubt, much must depend on the efficiency of the rainage, depth of the ploughing, and complete disintegration of he old surface; but I humbly apprehend, as I already hinted, hat the accumulated store of previously existing vegetable food, resident in and under the old turf, was the chief agent in exciting and maturing the fine crops that followed.

The same consequences are often experienced on new enclosures, if the ground has been properly pared and burnt, if necessary, deeply ploughed, levelled, drained, if requisite, the divisions formed rectangularly with reference to the slopes of the surface, and the ditches or main drains occupying the hollows which have free outlets. All such labours executed on old heaths or commons, of tractable soils of meddling or even inferior quality, soon become highly productive, especially for the first eight or ten years after they are brought under the plough, and merely because the soil, of whatever description it may be, is fresh to the seeds sown upon it.

When the gardener wishes to form a compost for his plants of the purest and most salubrious soil he can obtain, he does not go to the rich quarters of his kitchen garden, but repairs to a green common or old pasture, and there choosing the top spit, which he knows contains that nameless quality which is so exciting and nutritious to vegetation, readily obtains what he wants.

In newly peopled colonies, when the settler finds that his first cultivated grant begins to fail in its amount of produce, he immediately removes to a new station to enjoy a repetition of the success consequent upon the first breaking up of virgin soil.

These circumstances are mentioned to shew that, however carefully and skilfully the works on Whitfield farm were executed, a considerable share of the subsequent success is ascribable to the latent store of nutritive matter set at liberty by the operations of the plough, &c., and it is not only a proof of the practicability of such improvements, but it is one of the most useful agricultural experiments ever made; and, as an example, is particularly seasonable, now that there is such a general demand for an extension of British agriculture. For any capitalist who has or may have such description of land as Lord Ducie's, or even such land as may be seen on many barren commons, it is equally capable of improvement, and at far less expense than was required at Whitfield. The grand objection to reclaiming waste land is the idea that it will never repay the expense of bringing it into

cultivation. The result of what has been done at Whitfield is enough to banish this idea, provided the character of the soil be similar. It is true there are some kinds of land which would, perhaps, never repay the cost of reclaiming, such as deep moist tenacious clays, full of large stones and sunk rocks; or, which is equally difficult, flowing sands, that can neither be ploughed nor can even a ditch be dug to receive or carry off the water with which the soil is saturated to a great depth. Here draining is impracticable, there being no natural outlet, nor can such land be laid dry except by an absorbing artesian well. A thick luxuriant turf is in time formed upon such sands, and which serves as a pasture for light horned stock.

But Whitfield is an example for the proprietors of what are called the inferior corn land of Britain. Some of these are loamy or sandy gravels, subject to burn in summer, owing to their want of depth of staple; in such case the subsoil and trenching ploughs might be profitably employed. Others are thin moor earth, or gravels upon the chalk formation, and these would also be greatly improved by the same implements. In short, there is no description of these inferior soils but may be made doubly valuable by applying some of the expedients practised by Mr Morton on the before-mentioned farm.

It has been said that British agriculture may be so much more improved by additional skill and well-directed labour, that twice the quantity of corn may be produced than there now is. Now, if such a circumstance comes within the bounds of possibility, it must be by the adoption and performance of such measures as were advised and executed by Mr Morton at Whitfield. There are many thousands of acres of such unproductive land, and capital is only wanted to realize the views of the sanguine friends of British agriculture. If we had five thousand Lord Ducies in this kingdom, and as many Mr Mortons in full employment, a great change would soon be apparent, not only in the system but in the profits of husbandry.

Mr Trimmer is of opinon that "there is in this country abundance of surplus capital, both for the improvement of our own soil and the reclaiming the waste lands of our colonies. The more emigrants the greater demand will there be for our manufactures, as the custom-house returns of exports to the colonies incontestibly prove; and the greater the demand for our manufactures the greater will be the demand for the products of the soil, and the larger the number of our population that can be employed in its cultivation." M.

The Use of Salt to Man and Animals. By JAMES H. FEN-N..., Author of "A Natural History of Quadrupeds," &c.—Com-

mon salt, or muriate of soda, is the salt which has been longest known. Its effects upon man and animals are striking and important. In moderate quantities it seems to be a natural stimulant to the digestive organs, and is supposed to furnish the necessary supply of soda to preserve the bile in an alkaline and antiseptic condition. The estimation in which salt was held amongst eastern nations is very remarkable, and may be traced to the highest antiquity. There appears, however, to be one portion of the globe in which salt is despised by many of the people. "It much surprised me," says a traveller, "to see some of the South American aborigines eat their provisions without salt, though they have it in great abundance. If you offer them any food that has the least grain of salt in it, they spit it out with great disgust." There are many countries in which salt has never yet been found, and where, owing to the little commercial intercourse, the inhabitants can only occasionally indulge themselves with it as a luxury. In the interior of Africa this is particularly the case. "It would appear strange to a European," Mungo Park observes, "to see a child suck a piece of salt as if it were sugar. This, however, I have frequently seen, although the poorer class of inhabitants are so very rarely indulged with this precious article. To say that a man eats salt with his provisions is the same as saying he is a rich man." This celebrated traveller suffered great inconvenience from the scarcity of salt; and any European who has been accustomed to its use, experiences a painful longing for it when deprived of it. Moorcroft and Trebeck, in their "Travels in the Himalayan provinces," tell us that the Ladakhis and Tibetans boil soda and fossil salt with their tea, of which they drink large quantities in the course of the day. It is important to be known that one of the ill effects produced by an *un*salted diet is the generation of worms. In the *London Medical Journal*, (vol. xxxix.,) Mr Marshall has published the case of a lady who had a natural antipathy to salt, and was consequently most dreadfully infested with worms during the whole of her life. In Ireland, where, from the bad quality of the food, the lower classes are greatly infested with them, a draught of salt and water is a popular and efficacious cure. Dr Paris has noticed the bad effects of a diet of unsalted fish. Rush says that he has administered many pounds of common salt with great success in worm cases. Lord Somerville, in his address to the Board of Agriculture, gave an interesting account of the effects of a punishment which formerly existed in Holland. "The ancient laws of that country ordained criminals to be kept on bread alone, unmixed with salt, as the severest punishment that could be inflicted upon them in their moist climate. The effect was horrible; these wretched criminals are said to have been devoured

by worms engendered in their own stomachs." The wholesome-ness and digestibility of our bread are undoubtedly much pro-moted by the addition of salt which it so universally receives. Dr Dyer says that, in the Mauritius, the planters' slaves rarely obtain salt, and are therefore extremely subject to worms, while the government slaves and the convicts get salt in their rations, and seldom suffer from those intestinal parasites. Some planters, regarding economy and the health of their slaves at the same time, give a table-spoonful of salt in half a pint of water to each slave regularly every Saturday after work; and they find that this dose acts not only as a vermifuge, but as a tonic. A naval surgeon, who used to prescribe salt water for his patients in all disorders, happened to be drowned one evening. Next day the captain, coming on board, inquired for the doctor, and was coolly told by a sailor that "he was drowned last night in the *medicine chest*."

The fondness of animals for salt is often remarkable. Professor Gmelin tells us that a female wild ass which he brought to St Petersburgh preferred brackish water to fresh. In their wild state, asses feed chiefly on the most saline and bitter plants of the desert, as the *kalis*, *atriplices*, *chenopodium*, &c. Bryant says they will discover distant waters by the smell; and one may infer that they do this by inhaling the saline emanations from them. Sir Thomas Bernard, in his interesting work, entitled "Ease of the Salt Duties," says—"In visiting Alderman Farley's salt works at Droitwich, in August, 1817, I was struck with the appearance of an old black horse, that worked the machine for raising the brine. He was in very good condition, and his coat was like the finest black satin. I asked what made the horse so sleek and plump; the answer was, that he had regularly a little salt in his chaff three days in the week, about four ounces of it on each of the three days; or, if he was not very stout, then sometimes a little more; but that, in general, the horse was very well, and did his work well. He said he did not give him the whole four ounces at once, but at several times, about a table-spoonful each time. The horse had been purchased by Mr Farley about four years ago, being then about twenty years old, and his health and appearance, though he had constant work, had very much improved since; the salt, he added, had made him eat his food, and work better." Mr John Taylor, the agent of the London company for working the Real del Monte silver mines in Mexico, informed Dr Paris that the ore, which consists of the sulphuret of silver, is, together with mercury, amassed in heaps with iron pyrites and common salt; and that such is the greediness of the mules employed in the works for salt, that they are constantly licking the materials: the consequence is, that a po

ion of the silver amalgam is introduced into their stomachs. The animals, however, suffer no inconvenience; but, after death, on opening their stomachs, it is not unusual to find considerable masses of silver, the mercury having escaped, or been dissolved by the gastric juice.

Camels, according to Mr J. Wilkinson, will drink water which is too salt to be drunk by the Arabs. Gazelles live in immense herds upon the open plains, where they browze upon the saline and pungent herbage. The Americans call the salt springs *deer-licks*, because the deer and elks (*Cervus Alces*) frequently repair to them, not only to eat the saline herbage, but to lick the wet pebbles. They come in such numbers to these salt localities that the ground about is trodden into mud by them.

Pliny only alludes to salt as a beneficial ingredient in food for grazing. In his "Natural History," (Book xxi. chap. 7,) he tell us that cattle have an avidity for a salt pasture, and that cows fed thereon give more milk, and much better for curding into cheese, than upon ground not of a saline nature. In some parts of Africa, large herds of cattle travel from great distances, at stated seasons, to enjoy the marine plants which grow on the coast and are saturated with sea salt. The fattening property of our own salt marshes is well known to graziers and farmers. In Smith's "Wonders," it is stated that the water of the salt mines near Eperies, in Upper Hungary, afford "a blackish salt, which is generally given to cattle." For many years, it has been the custom in Germany, and particularly in Wirtemberg, where a vast number of oxen are bred, to give doses of glauber salts to cattle. As long as common salt was more expensive than glauber salts, it was thought that the inhabitants of Wirtemberg used the latter through economy, but this supposition must have been erroneous, as they still continue to use glauber salt, although the discovery of salt springs has rendered the domestic salt exceedingly cheap. The reason they assign for this preference is, that it conduces, by its purgative qualities, to keep the cattle in good health, and that even when, from long habit, they become less liable to be acted on by it, it still promotes digestion, and brings the beasts into good condition more rapidly. Two doses are generally given each week. A horse has an ounce and a-half; an ox or a cow receives an ounce; and sheep three quarters of an ounce; and a pig about half an ounce. Should its purgative effects prove too strong, the dose is diminished. There is no trouble in administering the salt, as it is merely sprinkled over the food. The price of it in Germany is a mere trifle, as the mines of Bouxviller, in the department of the Lower Rhine, furnish it from the manufacture of ammonia in great plenty. Matthew Aphonin, a Russian naturalist, remarks that

" oxen fatten very quickly upon the sea-coasts where the a grass, (*Triglochin maritimum*,) their favourite food, abou and if this be so, it is probably ascribable to the saline nat the plant, and to the sea-breezes containing particles of which appears to be necessary to stimulate their digestive or and, therefore, conducive to their health. In Upper Ca the cattle have plenty of wild pasture to browze on in the w but, once in a fortnight, they return, of their own accord, t farms, to obtain a little salt; and when they have eaten it r with their fodder they repair again to the woods. D'Azara us that, in some parts of Paraguay, salt is not given to the of cattle; but they are supplied with the *barrero*, (a sali nitrous earth,) which they and other animals seek with av and without which they fail and die in the course of four mo From the 27° of south latitude to the Malovine Islands, have no need of the *barrero*, because the water and pa grounds are sufficiently salt; but northward, beyond this tude, it is necessary, and the plains which do not contain it neither the ox, horse, ass, mule, goat, or sheep.

Dickson, in his " Husbandry of the Ancients," tells us they accustomed to prepare the straw for feeding stock by keep for a considerable time steeped in brine; that it was then rolled up in bundles, and given to oxen instead of hay. In S the practice is of great antiquity, (for we remember readi it in some Latin author,) and in the low countries, where have no traditional data to ascertain its first introduction am them." Dr Brownrigg, in his " Art of Making Common (1748,) remarks that " salt provokes the appetite, streng the stomach, promotes the concoction and digestion o aliments, &c., and is most friendly and agreeable to the h body. Moreover, black cattle and sheep take a pleasure in ing it, and by it are preserved from many diseases; the thrive to admiration upon it." The *Museum Rusticum*, (1 confirms this by the practice which had long before been sued in America, " where," says the American contribut the above work, " we think it in a manner absolutely nece and, accordingly, give it to almost every kind of cattle, and with parted hoofs are particularly fond of it. To this prac feeding with salt it is generally ascribed that our cattle much more healthy than the same animals in England; c it is that they are subject to much fewer diseases." Th experiment as regards sheep, instituted in England, see have been in 1801, on the estate of the Board of Agricu Lord Somerville's account of this experiment is excee interesting and important, and too little known. " The his lordship relates ... is given in the morning when the

e looked over, in order to counteract the ill effects of the dew. n an average, one ton of salt is annually consumed by a thou-nd sheep. A small handful of salt is put on a flat stone or ate, and ten or fifteen of these slates, set a few yards apart, ffice for one hundred sheep. At first, the sheep may be moved wards them; if they feel a craving for salt, they will lick up uickly as much as is necessary; if they do not want it, what emains dry when the sheep are next looked at is taken up and eserved for future use. Twice a-week has been usually found ufficient; in particular cases it may be offered thrice. Of a lock approaching to one thousand, there are not ten old sheep which have not taken kindly to it, and not a lamb which does not consume it greedily. When turnips, in the early season, are stocked with sheep, and the greens are rank and strong, many die suddenly, especially two-toothed sheep, the disorder, arising from excess of fermentation in the stomach. In this disorder, hay and salt are devoured with a greediness that denotes their salutary effects. In the rainy and unfavourable autumn of 1801, we did not loose one sheep in turnips, and, probably, *never shall*, whilst we persevere in the use of salt. In the autumn of 1802, we had many hundred fat wethers, ewes, and hog sheep, in tur-nips, and lost two the first month the turnips were stocked. Certainly the chances were, that in any keep, and any season, more might have died out of so large a flock. In strong pas-tures, when seasons are wet, the rot often spreads destruction over whole tracts of the country: in such a case, salt must be beneficial, and an object of national importance. It is supposed, and with great truth, to correct acidity in the stomach, a disorder common to sheep even in Spain, but of a much more serious nature in the damp climate of Great Britain, more particularly when stocked on green floaty food, such as turnips, vetches, and young clover. Salt may not be a specific on land naturally unsound—such land it is madness, at any rate, to stock with sheep; but where the rot occasionally prevails, those who have carefully noted how salt affects cattle, can hazard little in supposing that the disease will be much less heard of when such a corrective is applied." There can be no doubt that salt is a great preventive of the rot, and of those parasitic creatures called *flukes*, which attack the liver of the sheep. The flocks that feed on the syenetic hills of the Cheviot, and adjacent and similar soils, the shepherds say, may pine, but cannot rot. "In visiting Mr Mosselman, who occupies a large farm on the Continent, I was surprised," says Sir John Sinclair, "to find a quantity of rock salt from Cheshire. He assured me that, by allowing the sheep to lick it, the rot was effectually prevented." In Spain, salt is given as a medicine for the rot. Sir John also tells us that a

Mr Bracebridge "drenched some rotten sheep night and morning with strong brine, after which he did not loose one; they became fat, and the meat was fine and good, as if the animals had never been affected." Mr Curwen says that, after his first trial of salt upon sheep, out of fifty shearling Devons which he killed, there was not one unsound; whereas, previous to the use of salt, it was rare to find a liver that was not more or less tainted. In short, salt keeps a flock healthy, does no harm, and the expense of providing it is but small. The Saxons and Spaniards attribute the superior fineness of their wools wholly to their liberal use of salt. Every sheep ought to have two ounces of salt per week, spread very thin upon tiles or slates in the field.

The natives of Java say that salt poisons the Javanese civet, (*Viverra Rasse* of Horsefield.)

To cold-blooded animals, inhabiting the land and fresh water, salt seems always to prove fatal. The Prince of Musignano, an able and celebrated zoologist, says of the warty newt, (*Triton cristatus*, Lawr.,) that if a little salt be sprinkled upon it, it dies with the most violent convulsions, although this amphibian is generally so highly tenacious of life. Salt proves equally fatal to earth worms, snails, slugs, and insects. Hence salt and water, poured over gravel walks, preserves them in good order, by destroying the worms whose earth-casts are so unsightly. To destroy insects, salt is best administered with a garden syringe.

Comparative Experiments with Guano, Rape-dust, and Dung, in 1842. By Mr James Caird, Baldon Mains, Wigtonshire.

On Potatoes, (*Cups.*)

	When planted.	When raised.	Rate of manure ℔ imperial acre.		Produce ℔ imperial acre		
			tons.	cwt.	tons.	cwt.	lbs.
1st, With no manure,	April 23, 1842	Sept. 2	0	0	5	17	58
2d, With farm-yard dung,	—	—	20	0	9	3	47
3d, With guano,	—	—	0	6	8	12	7

The potatoes manured with guano ripened a fortnight earlier than the others.

On Turnips, (*Yellow.*)

	When sown.	Taken up and weighed without tops and roots.	Rate of manure ℔ imperial acre.		Produce ℔ imperial acre.		
			tons.	cwt.	tons.	cwt.	lbs.
1st, With farm-yard dung,	June 14, 1842	Decem. 8.	20	0	23	6	52
2d, With rape-dust,	—	—	0	8	21	19	72
3d, With guano,	—	—	0	4	21	4	18

The Extirpation of Ferns from Pasture. By Mr ROBERT [illegible], Marmion Place, Innerleithen.—As it is obviously impracticable to cultivate the mountains of Scotland with profit where the plough cannot be employed, the improvement of pasture becomes on that account a matter of the utmost importance. It is a fact well known to the cultivators of the soil, that it becomes eminently productive only after the persevering care of human industry, and that it abounds in species of plants capable of affording nourishment to sheep and cattle only after conversion into artificial pasture, or after the destruction of useless and pernicious plants which, in every country, overrun the valuable herbage. That the fern or brake occupies no inconsiderable portion of the richest soil of our mountains must be consistent with the knowledge of almost every store-farmer in Scotland; and that this plant is not unfrequently found so thickly planted and of so rank a growth as completely to exterminate a variety of grasses valuable for sheep pasture. Hence follows the propriety of their eradication.

With a view to accomplishing this, Mr Ballantyne of Holylee, Peeblesshire, upon whose property ferns abounded to a most injurious extent, in the year 1833 directed his shepherds to irrigate various patches by way of experiment; but no sooner had the ferns disappeared in consequence than up sprang a host of thistles, still more noxious to sheep pastures than even the fern. That the thistles were produced in consequence of the ground being irrigated there can be no doubt whatever; but it is somewhat strange that, in some description of soils, thistles immediately make their appearance upon land being rendered free of excessive moisture. In proof of this, I may state that an extensive bog on the farm of Gemscleuch, on the estate of Thirlstane, the property of Lord Napier, was surface-drained some years ago at a very considerable expense, and, no doubt, in the confident expectation that it would be rendered highly productive in consequence; but, in place of this being the result, to the astonishment and sad disappointment of Mr Laidlaw, the tenant, it produced, the first year, a most extensive crop of thistles—so extensive, indeed, that the tenant at once and for all abandoned the idea of eradicating them. It is, however, consistent with my knowledge, from a recent experiment, conducted upon a scale of considerable extent, that cutting thistles two consecutive years will destroy them. That the fern can be eradicated from mountain pasture by irrigation has been proved by a variety of experiments on various farms in Peeblesshire; and, although the result in some few instances has been the production of a rich sward of grass in place of thistles, still

it must appear evident, to every one who has a knowledge of our pastoral mountains, that there are comparatively few instances where it is practicable to command the necessary quantity of water; and on that account alone, all the extent of ground which can ever possibly be improved by irrigation will scarcely amount to a fractional part of the whole space occupied by the fern.

From time immemorial, the inhabitants of Innerleithen have been accustomed to collect ferns annually from the adjoining mountains for the purpose of pitting or securing their potatoes during the winter months. For a number of years past, also, many of them have been in the habit of keeping pigs, and, from their having the command of no other material for litter than the fern, the competition in collecting it has, in consequence, become of late years so very great, that many of the pig feeders, (unwittingly for themselves,) in place of allowing the ferns to come to maturity, as usual, before cutting, have mown down large quantities of them while young and succulent. This has had completely the effect of eradicating them from the soil. On some patches, however, a few sickly plants are still left to point out the ground where, five or six years ago, ferns were produced in the greatest abundance.

As an additional proof that repeated cuttings of the ferns while young and succulent will eradicate them from sheep pasture, I may mention that, in the year 1834, Mr Ballantyne of Holylee, engaged two experienced mowers, for five weeks, to cut the ferns on Blackcleuch and Brakenhope, both of which are farms of great extent, many of the patches of ferns covering five or six acres of land. Although the plants, after a second and third year's cutting, became extremely feeble and sickly looking, still the operation of mowing was found necessary to be repeated on the month of July for five consecutive years before the ferns were totally extirpated; and in many places, where they were rank, it was the third year after the first cutting before the surface was completely covered with a variety of grasses and white clover. Although the extent of ground subjected to the experiment has not been actually measured, it is the opinion of those conversant with measurements, as also of those who have a practical knowledge of the ordinary quantity of ferns that a mower will cut in a day, that the whole extent of ground from which the ferns have been extirpated cannot, at the most moderate computation, be less than a hundred acres, which are at this moment the richest and most productive portions of sheep pasture on the estate of Holylee. The whole expense of extermination mounted only to the comparatively trifling outlay of £25 sterling, being at the rate of 5s. an acre.

Notwithstanding the favourable results pointed out in conse-
uence of the eradication of the ferns, I am decidedly of opinion
hat, wherever they are not so thickly planted together as to
revent the soil from enjoying the benefit of the sun and free air,
hey ought not to be extirpated, as they are of material bene-
t to sheep, both as shelter and shade, immediately after
eing deprived of their fleece. In consequence also of the ferns
cting in some measure as a shelter to the soil, there is invari-
bly to be found amongst them, and in their immediate neigh-
ourhood, a very abundant crop of pasture grasses which cannot
il to secure an ample bite in the latter end of autumn and
arly in spring. On many farms, when the land is liable to be
arched during a hot summer, the ferns are of essential benefit
s a shade, because of preventing the rays of the sun from
xtracting the moisture from the soil, and thereby securing
efreshing and palatable food for sheep.

Other advantages also may be obtained from ferns. In the
ear 1826, a season of great scarcity of fodder, in consequence
f excessive drought, Mr Gibson of Laidlaw-Steel, and Mr Fair-
airn of Luggate, both farmers in the parish of Stow, fed their
attle during the whole winter with ferns, upon which they
hrove exceedingly well. In the year 1836, likewise, Robert
'reston, carter, Innerleithen, fed his horses for three months
ntirely upon ferns, with the exception of a small allowance of
otatoes, which were given them morning and evening, and dur-
g the whole period they performed a regular and ordinary day's
ork. That turnip-feeding sheep eat ferns readily, is a fact
onsistent with my own knowledge, and, while young and succu-
nt, they are a most valuable accompaniment to potatoes in the
eding of pigs.

The Expediency of Forming Arboricultural Societies. By Mr
'ETER MACKENZIE, Stirling.—It has been lamented by old writers
n foresting, as well as of those of the present day, that little
kill is exhibited in the management of woods; and it is cer-
inly remarkable that, after the lapse of two or three hun-
red years, the evils complained of then should still be found
exist. In our old woods we have loads of rottenness, and,
ven among our best timber, many hollow trunks are occasioned
y carelessness, and deformity appears to be little regarded;
nd this is so common, that what are denominated timber trees,
re little else than overgrown shrubs. Land is still planted with
rees that will not thrive upon it, and where they would thrive,
re neglected for years, until thousands of them are ruined.

When we observe the rapid improvements taking place in agri-
ulture, horticulture, and floriculture, the question naturally arises,

What can be the cause of the very slow progress making in arboriculture? In considering this question, it cannot fail to be remarked, that the Highland and Agricultural Society of Scotland has been the means of awakening the minds of the cultivators of the soil and the rearers of cattle to inquire for the best mode of cultivating the soil, of improving the varieties of grain, and the best breed of stock.

The various products of the kitchen-garden and flower-garden are also exhibited under the patronage of kindred societies, and what appear excellent in their various departments are properly recommended and eagerly sought after. I am not aware that the products of woods are so exhibited. Might there not, then, be societies formed among foresters for the improvement of woods as well as there are those amongst farmers and gardeners for the improvement of their respective products? If such societies were encouraged by the proprietors of plantations, their efforts would certainly be the means of changing some of the modes of planting and pruning now practised, to the great advantage of the plantations and profit to themselves. As it is, we still find the Scots fir planted in wet situations producing annually shoots about six or eight inches long, whereas, if superfluous moisture were removed by proper draining, they would have made shoots of two feet or thirty inches in length in one season; and although this difference of growth is daily witnessed betwixt firs planted in moist and dry ground, the ground is but rarely properly prepared for planting. If wet ground must be planted, let it be with such trees as will grow freely where moisture abounds, such as alder and willows.

We find that the oak will grow well in a great variety of situations, but it is often planted in soils where it will not flourish, such as in damp shallow soils with a tenacious subsoil, where it has commonly a very stunted appearance, bearing an abundant crop of lichens and mosses. How pleasant soever a wooded park may appear in the landscape, many of them will not bear a close inspection as to the quality of the timber growing in them. It is a pity to see so many trees deprived of half their value, by the careless manner in which they have been allowed to grow in the early period of their growth. Many thousands of oaks are living at the present time, aged sixty, seventy, or eighty years, whose trunks are only six, seven, or eight feet in height, and the upper part of them are allowed to run to branches that obtain but little value in the market. Many planters pay little regard to the species or variety of oak which they plant; whereas every forester ought to know the difference between the red oak (*Quercus sessiliflora*) and the white oak, (*Q. pedunculata*,) as it

been well ascertained that there is a great difference between m in regard to quality, and the worst species is that which is st cultivated at present. The same remarks may be applied other forest trees, such as the ash, elm, plane, lime, &c., for in many instances they exhibit marks of bad treatment, either regard to the soil in which they are planted, in the training ey receive afterwards, or in the inferior varieties reared from ed.

In Scots fir plantations, several varieties may be observed owing together. There is a very inferior one, common enough most woods; it has short leaves, and these thinly set upon the anches, and, as a necessary consequence, it produces but little mber. There is another variety, and perhaps it is the most mmon in our country at the present day, which, when planted proper situations, grows rapidly, but the quality of the timber inferior compared with another variety which is cultivated some parks in the neighbourhood of Stirling. The oldest trees this variety of Scots fir, with which I am acquainted, are rowing on the Auchenbowie estate, four miles from Stirling, here they are supposed to be about one hundred years old. here are also trees of the same kind growing at Blairdrummond, hich are said to have been raised from seed gathered from those f Auchenbowie. Their worth is appreciated at Blairdrummond, nd the seed they produce is carefully preserved, in order to raise oung plantations of valuable timber. Perhaps it may not be ut of place here to give an extract from Menteath's "Forester's uide" respecting this variety of Scots fir:—

In the year 1795, at the request of the owner of a house in Bannockburn, Stirngshire, I made myself some window sashes for his house from the common Scots r, being the wood of some old trees which I had cut from the estate of Auchenowie, in the same county. For the same house and at the same period I made me sashes from the best Gottenburgh deal then imported; these sashes were put to oak cases or frames, where they at present stand, (1820,) being twenty-five ars of age. The Scots fir sashes looked as well at the time they were put in, d do to this day, and appear to be equally durable as those made from the foreign al.

He also adds that several bound doors were made of the same rt of timber without paint, and, at twenty-five years after they ere made, looked as fresh as when first made. I may also state at I have made inquiry respecting the window sashes and ound doors referred to, and have reason to believe that they are good condition still, although made forty-eight years ago. his variety of Scots fir is probably the same as that which rows in the pine forests of the north of Scotland, such as Aberethy, Duthil, Rothiemurchus, and Glenmore, and known by the ame of the horizontal branched pine, (*Pinus sylvestris horizontalis* f Loudon.) Whether this variety may be obtained pure from eed grown in the Lowlands of Scotland, where the inferior varieies abound, may be doubtful; for it is well-known that a number

of families belonging to the order *Conifera* produce an abundance of pollen, and it is possible that pollen from the inferior variety of Scots fir may be wafted to the pistils of other varieties, and produce seed of an inferior kind; and there are already many varieties of the *Pinus sylvestris* described by botanists.

On looking over a young plantation of oaks, some of them may be observed to be growing vigorously and forming handsome-looking trees, others stunted, and, although much care may have been bestowed upon the plantations, they will have a shabby appearance. If as much care were bestowed upon selecting seed for the nursery as in other departments of cultivation, we have reason to believe that similar results would be obtained; but as long as seed is gathered from stunted and unhealthy trees—and in most cases these produce seed in the greatest abundance—we cannot expect the progeny to be improved from the stock from which they were gathered.

Those who wish to raise an improved variety of turnip-seed will not select those roots which exhibit bad properties; nor will the grower of cabbage or cauliflower seed be likely to obtain a true kind from plants indicating degeneracy. They know the spurious effects which will be produced by an intermixture of pollen, and endeavour to guard against it as much as possible; and I am not aware of any anatomical structure described by vegetable physiologists which should prevent similar effects taking place in plants of the *Amentaceæ* and *Coniferæ* orders—orders which contain most of the timber trees of Europe. And if it be of importance to the farmer and gardener to have true varieties of turnips, cabbages, and cauliflowers, and other kinds of the Brassica family, surely it is of greater importance to foresters to secure the quality of young trees which are to afford timber to future generations; in the one case the loss may be for only one year, in the other it may extend over a century.

Perhaps much of the evil complained of might, in a great measure, be avoided in future by the establishment of associations having for their object the improvement of forest trees. Prizes offered for the best grown trees at a certain age, in certain soils and situations, and, where trees are too large to be exhibited, figures of the living trees, or sections of felled ones, could be exhibited, in order to shew the quantity and quality of the timber they contain; and as there is great diversity of opinion respecting the best mode of pruning forest trees, and the time when it ought to be done, or whether trees should be pruned at all, such societies might settle such disputed points, and not only these, but many others which have caused much discussion. Even vegetable physiologists differ whether close pruning or leaving long "snags" should be preferred; one party asserting that close pruned branches [illegible] fine trunks, and the other that they hasten

a decay of the timber, causing rottenness; and, as very different methods of pruning have been adopted, since the days of Evelyn to the present time, it might be instructive to ascertain the results of the several methods which various writers on the subject have recommended, from the earliest period down to Billington and Cree.

If such societies were formed, they might also direct attention towards neglected plantations. It often happens, both in gardens and plantations, that injury is done to a considerable extent by trees which were intended to remain only for a limited period; but, because riders in gardens perhaps bear well, they are allowed to remain, when doing great injury to those which are intended to fill the wall; and in plantations, the larch and other fast-growing trees are permitted to live to such a time as nearly to ruin the hardwood, by depriving them of light, and destroying their leaves. Neither ought the diseases of timber to be overlooked; for trees are subject to many infirmities, such as—

> "The calf, the windshoc, and the knot,
> The canker, scab, scurf, sap, and rot."

Although arboriculture may not be deemed of so much importanee as the cultivation of human food, yet it is of great usefulness, and has certainly not received the encouragement which its importance demands. If these hints be the means of exciting foresters to adopt one great and good plan of managing forest trees, they will not have been written in vain.

Miller's Safety Reins.—Those only who have experienced the feelings on being run away with a horse can fully appreciate the utility of reins which will infallibly pull him up when desired. It may be all safe enough, when the reins are sound, to try and pull up a runaway; but how seldom are reins which have been in use some time to be trusted in a genuine hard pull, when a determined and powerful horse starts off with the bit seized in his teeth, and holding his neck stiff with all the power of his muscles? In such a case, either the leather or a buckle is sure to give way, especially in the long reins of a harnessed horse, and then the poor whip, with all his fortitude, cannot avert a crash against the first object which comes in his way; but should he loose heart when the horse darts off, and when he sees first one splinter and then another of the splashboard go whirring past him by successive raps of the horse's heels, he has not the pluck to pull the soundest reins with the requisite force to stop a galloping horse, and his condition then is nearly as bad as when the reins break. Could any apparatus be attached to ordinary harness, which would certainly arrest the career of a runaway horse, and the use of which would be so easy as to inspire confidence in the most timid driver or rider, an essential benefit would be conferred

on many who cannot enjoy a drive without fear. Si apparatus are the reins invented and patented by Mr Ale Miller, saddler, 27, Lothian Street, Edinburgh. They we believe, of gut covered with leather, and are, therefore against fracture; and being round, and of neat light appe form a rather ornamental and sporting-like appendage ness or saddle. They are mounted in this way:—Th through a hook placed on the head of the harness-brid through a leather loop on the head of the riding-bridle, an down on each side of the neck. About middle-way do neck is a coupling with two swivels, which receive the rein the head, and they then pass through the dees of the h and through the turrets of the harness saddle, and along front of the splashboard to a rein-holder, by which they are l ways ready for use. The head of the horse and the turrets saddle being both higher than the throat, and the coupling short, and having leave to traverse the reins on each side neck, it settles on that part of the throat at which the re being pulled, exert the greatest force, when, the windpipe forcibly compressed, the horse becomes affected in his r tion, and, therefore, stands still or slackens his pace for l which he immediately obtains on the reins being slac Thus, feeling he is mastered, the horse shews no farther incli to run off again; but in case he should renew symptoms of ing off, a few firm grips of the coupling on the throat will l feel the futility of his attempts.

The reins were tried with a horse on the 5th October, in the presence of thirty gentlemen in Edinburgh, experien horses; and a small committee of the directors of the Hi and Agricultural Society, consisting of Mr Sligo of Carmy Mr Dalzell of Whitehouse, witnessed their application 31st May, 1843. Colonel Borthwick also saw them applied 24th May. Mr Sligo and Mr Dalzell gave in a report o they learned and witnessed of the origin and application of reins, and the following quotation constitutes the princip of that report:—

The mode of using the reins is extremely simple, being merely to seize th mity of them and tighten them. The windpipe of the horse is thereby com and his respiration stopped or impeded; and the effect is, to cause the a halt immediately.

In explanation of the origin of the invention, Mr Miller stated that h farmer's son, and that, in his youth, he used to be employed at times to a catching horses at grass, by means of surrounding them with a rope, borne b son at each end of it. He remembered that, in this service, although no r was laid upon the horses when the rope rested on their chests, yet, whenever be got upon their throats, they instantly stood still and allowed themselv taken. The idea which this recollection suggested, of the probable effect of p on the throat in stopping a runaway horse, led Mr Miller to the contrivance safety eins. In his first experiment, the band which connects the reins un .ecl vas attached to the headstall by hooks and straps; but it has been con

an improvement to allow it to move freely upon the reins, on which it settles in contact with the throat, in a proper position for use when required.

Our communications with Mr Miller impressed us favourably in regard of his contrivance; but, wishing to see it in practice, we availed ourselves of an offer by him to afford us an opportunity of judging of it in operation. We, accordingly, on a day appointed, accompanied him in a carriage drawn by one horse, for the purpose of trial; and we witnessed as spectators, as well as made ourselves, repeated tests of the reins, with the horse going at a smart canter, both on a level road and on a descent, and we invariably observed that the tightening of the reins caused the horse immediately to stop. No injurious effect seemed to be produced on the horse by the interruption of his respiration. He always appeared to breathe freely, and to be ready to resume his work, as soon as the tension of the reins was relaxed.

Upon the whole, therefore, we consider Mr Miller's invention to be a neat and simple, as well as, to appearance, an effective contrivance for the accomplishment of its important object, in the prevention of the disastrous accidents which not unfrequently occur from horses running away; and we think it reflects much credit on the ingenuity of its inventor.

The price, we understand, of a rein for a saddle horse is 15s. 6d., and its weight is 7 oz.; a rein for one horse in harness, with hook and rein-holder, and brass mounting, 31s. 6d., and its weight 18 oz.; for a pair of horses, 42s., and weight 28 oz. These prices appear to us in no degree extravagant, and we know that the rein is no eyesore upon the harness or horse.

An Estimate of the Value of different Manures. By M. Le Comte de Gasperin, Pair de France, &c.*—The subject of different animal manures is of such high interest to agriculture, their uses are so ancient and so general, that we might be led to suppose every question relative to them already decided; and yet, when we seek to know their intrinsic value—what they add to the soil submitted to culture, proportionate to their dose—when we endeavour to discover if this vulue is the same when employed for different species of vegetables, and what it is for each sort of vegetable separately—we are surprised to find these fundamental questions, which may have so great an influence upon the direction of cultivation, totally unanswered.

In fact, is it not upon the solution of these questions that most depends the degree of zeal in creating manures, and by that to a greater production of animal produce, which now scarcely suffice for our consumption? If the value of the manure was found to be advantageous, would not this solution influence its distribution in the rotations—would it not favour certain plants which are, perhaps, only neglected because the elements of the production are not well appreciated? It is not that some attempts have not been made to arrive at this decision by Thaër, De Woght, Crud,† but, to be convinced that they are not arrived

* From the Memoires de la Societé Royal et Centrale d'Agriculture, Année 1842. Kindly furnished us in translation by Mr Boswell of Kinguisie and Balmuto.—Editor.

† Since the compiling of this treatise, M. Puvis has published a work upon manures, the results of which I shall take care to compare with mine in my notes.

at a conclusion, and the importance of which we shall point out suffices to know the different methods followed in the agricul ral compatibility as regards manure.

Some persons merely assign to manure the price of the litt without considering that, if it be true that it acquires nothing its transformation into manure, it would be more expedient bury it immediately in the soil, without subjecting it to t labour of making.

Other persons balance the account of their cattle by the val of the dunghills, that is to say, after having inscribed their e penditure of forage and litter at the market price, cares, loss &c., they place, on the side of their profits, the price of catt sold, the price of their wool, of their lambs, of their calves, &c and, if this second total is less than the total of the first, th establish an equality by carrying the remainder to the value the manure. It results from this method that the value manure must, then, vary according as the breed of the cattle more or less profitable, and also as to the care and art shewn i rearing them.

Others give, as the value of manure, the double of what ex ceeds the produce of the parts manured over those which a not manured, under the supposition that a first crop consum but one-half of the nourishment. But, besides the difficulty making exactly an abstract of the crops off different soils an estate, this method is grounded upon an hypothesis, the ex actitude of which depends upon seasons which have more or le favoured the decomposition of the manure, its absorption by th plants, and the final success of them.

In the midst of these differences in practice, persons wh are sincere fear more the errors than any omission in the system and, without considering that omissions are errors, propose t suppress the account of manure from the compatibility of hu bandry.

Thus, in the actual state of the science of husbandry, nothin as yet has enlightened us upon the true value of manures. If the fabrication was always separated from rural cultivation, if th breeder of cattle had his interests apart from those of the agric turist, thus we might know upon what to decide; there wou be a market for manures, where the reciprocal interests would length equalize themselves, and we should know the exact val of this precious auxiliary to all good agriculture.

It is true that this market does exist in the neighbourhood great towns, but not in any degree in the equal condition whic we might look for. There is found usually in these markets superabundance of merchandise corresponding to the distance which it is advantageous to transport it, in equality between th ffer and the demand.

There are also a great number of artificial manures manufactured, but there remains a great doubt as to the real value of the greater part of them; and as for those which have already stood the test, they may serve one day as regulators, when their relative value with those of natural manures are well known; and, above all, when, the market being glutted with them, the equilibrium can be known and decided.

All these causes have left, up to this period, a very great uncertainty as to the intrinsic value of manures. Feeling warmly the importance of this question, I have long had my mind occupied with great solicitude upon the subject, and I have united several elements for its solution, which will, perhaps, contribute to call the attention of cultivators to it, and provoke such communications and researches as may complete the discovery.

In order to succeed in resolving this difficult problem, it would be necessary to combine such circumstances of culture as would enable us to appreciate, with exactness, the total product that might be drawn from a given quantity of manure. We must then render ourselves as independent as possible of the nature of the soil and of the climate. In meagre lands containing clay, a portion of the manure is absorbed by the earth, and does not immediately reappear. In a soil that contains carbonate of lime, there is a formation of nitrates by the atmospheric action, independent of the presence of the manure, as we shall prove hereafter; it is, therefore, upon a sandy soil that we ought to carry on our experiments.

Moreover, in dry countries, and years of drought, vegetation slackens from the month of May until the middle of October, from the effect of the dryness of the earth, and ceases for annual plants precisely at the moment that the heat would favour most their development, if it were accompanied by humidity; but irrigation re-establishes the freshness of the earth, and restores to vegetation all its activity. It is, therefore, upon land poor from want of manure, sandy, and that can be watered at will, that the result ought to be sought. I have had the good fortune to obtain a series of results accompanied by all these incidental circumstances drawn from a sandy soil, but slightly charged with clay and lime, that had been abandoned for a length of time, but which had recently acquired the good effects of irrigation.

It is, however, still but little to examine what occurs under these peculiar conditions—we should compare it with what takes place in dry lands and in the general condition of farming. If the experiments made upon soils that are watered give us the absolute value of the manure, those which result from the exa-

mination of common culture are only of value for the climate the soils from which they have been drawn; for this reason should be repeated in different places before they can becor general rule.

Therefore, the first part of this examination which conc the experiments made upon moist and irrigated soils, having its object the putting aside, (as much as it is possible to do, such experiments, the circumstances of soil and climate, approach by that very cause to a true decision, if it were pc ble to make an abstraction of a longer duration of the hot sea in our southern climates—a duration which would permit u profit in the same year of almost all the richness of the man and prevent the losses that longer remaining in the earth make it experience. As to the value of manure upon dry la it is entirely dependant upon the influence of the climate of different countries where the observations have been made, could not be admitted elsewhere without modification. I after these prefatory remarks that I present this memoir to observation of agriculturists.

I.—*Manure which has undergone Experiments.*

To give an assured basis to the facts which we are about to detail, it is nece to prove the quality of the manure which has been employed in these experim and which will become for us the standard (or normal) manure; for the vari composition of the mixtures which bear this name, and their state of decom tion more or less advanced, introduce great differences in their value.

The manure employed in the experiments of which we are now about to seel value, should be that which is produced everywhere in the most equal and variable state; because it proceeds from cattle subject to the same labour an ceiving the same nourishment. This is that which is procured from inns frequ by waggoners—it is formed of the excrements of horses and mules fed on oat hay, accumulated during a month—hot, but kept sufficiently damp not to hav come white—its straw is softened and crushed without being decomposed. It i species of dung whose saleable value is the best established; that from farms i sold, whilst that of inns has a current price. In the state that we have desc it in, it weighs 660 kilog. the cubic metre, but heaped and pressed on the cart i quires the weight of 820 kilog.

Dried in vacuo at 110 degrees, it contains 60.58 centi-metres of water, 100 of the dried matter gives 72.50 of organic matter. According to the analys Mons. Payen, 100 parts of this manure contain 0.796 parts of azote, and 100 o dried matter contain 2.07, thus 50.25 of our manure is equivalent to 100 o standard dung of Messrs Boussingault and Payen, that is to say, it possesses n double the value of the farm manure prepared in Alsace; I think, also, that it i better than that of our farmers in the south of France.

II.—*Value of Manure employed in different Crops on Moist Soils.*

It is to be understood here, by the worth of the manure, that of the surplus obtained by each additional quantity of manure; therefore, suppose that the gr cultivated without manure yields 2, and that with 1 of manure I obtain 3, the v of the manure will be 1 of the crop; also, if with 1 of manure I obtain 3, and wi of manure I obtain 4, this value will be equally 1 of vegetable product, and s

ach additional portion of manure employed to a certain limit, which varies rding to the plants, and which we shall endeavour to point out hereafter. We ll not, therefore, enter on the distinction of the nett revenue of each kind of crop, l we shall confine ourselves to discover how much the employment of manure ments the crops, by comparing them with what they would have been if manure l not been used at all, or if it had been employed only in a less degree. This ng laid down as a rule, let us pass on to the results obtained from various experints, first on watered lands, and then on dry lands.

1. *Wheat.*—The watered lands on the banks of the Durance compose an agriltural zone extremely remarkable for its products and for the industry of its habitants. Amongst the very varied rotation of different horticultural plants, heat is frequently sown, keeping very nearly to the following method, which I have and used in Sicily:—

The period of sowing takes place in the beginning of November. The seed is wn upon the land, which has been prepared and manured, or sufficiently improved y preceding culture. The ground is divided into ridges or beds from 1 to 2 metres ide, and each ridge is separated from its neighbour by a space of 25 centi-metres, hich is opened to the depth of from 5 to 6 centi-metres by one single stroke of the e, in order to let the waters destined for the irrigation pass off. In spring, when e wind has dried the earth, when rain is wanting, the average heat exceeds P 50 centi-grades, the water is introduced into the spaces opened between each of e ridges, and it is retained therein sufficiently long to penetrate through and rough by filtration, but abstaining from all submersion which would thicken the rth and would injure the vegetation. This irrigation, which may be called subrranean, is repeated, if it is perceived that the plants suffer by drought, but it rely takes place more than twice, and frequently is necessary but once.

The beauty of the vegetation leaves the cultivator but one fear—the lodging of e grain; but, notwithstanding this risk, the harvests are so fine and abundant, at the farmers are not deterred from following it. When the harvest is gathered t, at the end of the month of June, the ground is laid under water, and after allowg it to sink in and dry for two or three days, it is ploughed, and beans, potatoes, nd maize, or Turkish wheat, and millet, is sown, which they treat in the same anner. The second harvests, produced by the advantage of a soil that has been hus refreshed in the hotest months of the year, July, August, and September, are f great value. By these successive productions, stimulated by a moist heat, the rth is in a state that requires an abundant manuring for the cropping of the folowing year.

Having, under my own eyes, such conclusive and numerous experiments, it would seem that it must have been easy for me to decide the comparative relation etween the manure used and the crop of wheat obtained; but a great obstacle pposes this appreciation. This culture is often carried on without manure directly pplied, by taking advantage of the excess of fecundity, or, as the Germans say of it, riginal strength, accumulated by former cultivation. When manure is added, it is s a supplement to that which is supposed to continue to exist in the soil. The manure, too, is very variable in its quality, and frequently consists merely of the weepings of the town. An exact analysis of these different circumstances would xtend too far, and leave legitimate doubts upon the result, if they were not enlightned by positive experiment. I have had the good fortune to obtain, for some ears past, a series of facts, independent of these circumstances. These facts are, the culture of wheat upon new soil, as I have already described, with a fixed quantity of manure of known quality. Those lands situated near the Durance shewed their poverty by the meagreness of their natural vegetation. The ground was composed of loose sand, which had formerly been brought thither and deposited by the floods, and, without doubt, thoroughly washed; for there were only slight traces of organic carbonaceous matters without azote. No cultivator would have confided seed to such ground with hope of having a single return. Here are the results of three years of this culture:—

Years	Ares.*	Manured with	Produce of Wheat.	Value.	Second Crop.	Value.
1836.	10	20 metric quintals of Manure	122 Kilog.	35 f. 20 c.	540 Kil. Potatoes	20 f. 75 c.
..	ib.	30	204 ..	56 10	254 Haricots.	42
..	ib.	40	248 ..	68 20	3 Hect. Millet	35 20
1837	ib.	10	68 ..	18 70	70 Kil. Haricots	13
..	ib.	20	140 ..	38 50	1 Hect. 7 Millet	19
..	ib.	30	210 ..	57 75	1 Hect. Millet.	22
1838	ib.	10	72 ..	19 80	3?0 Kil. Potatoes	13
..	ib.	20	136 ..	37 40	160 Kil. Haricots	30
..	ib.	30	120 ..	60 50	1 Hect. 7 Millet	20
	90	210 Metric quintals manure.	1430 Kilog.	392 f. 15 c.		214 f. 95 c.

* An Are is equal to about 26 square fathoms, 114 square yards English measure, nearly 4 square poles.
Hectare, a new French measure; a surface of 100 ares = 2 acres imperial.
Kilo. Kilogramme, 1000 grammes = rather more than 2lb. English.
Gramme, the unit of the new French measures; it is the weight of a cube of distilled water, the side of which is 100th part of a metre.
Litre, the tenth part of a cubic metre.
Hectolitre, a hundred litres.

Thus 90 ares of ground produced, at the first crop, 1430 kilog. of wheat, after having been sown with 144 kilog. of seed; therefore, as it may be supposed that the soil, the least rich, will reproduce the seed, at least once, by itself, we shall have, by subtracting the weight of the seed for the first crop, the quantity of 1286 kilog., which will represent the action of the manure, but to this produce must be added the value of the straw.

This latter substance being destined to reproduce fresh manure, we cannot attribute to it in rural economy any other price than that which results from its equivalent as manure. This equivalent is, according to Messrs Boussingault and Payen,* of 16,666 for 100 of standard (or normal) manure, and, consequently, for ours of 331, the quantity of straw being (according to our local calculations) double that of the grain, or of 2,572 kilog., it is the value of $\frac{2572 \times 100}{331} = 777$ kilog. of manure which must be added to that of the harvest, or subtracted from the quantity of manure that has been furnished, this quantity is reduced from 21,000 kilog. to 20,223 kilog.

The 1286 kilog. of wheat remaining clear after the deduction of the seed for the first crop, bears a value of 353 franks 65 cents; the second crop, which has produced rough 214 fr. 95 cents, will be reduced also to the clear value of 193 fr. 29 cents, which will have produced a quantity of straw equivalent to 419 kilog. of manure, in the supposition that the whole of this straw equals, in value and in quantity, that of the grain, the nett produce of the two crops will then be 540 fr. 94 cents, which represent the results of 19,815 kilog. of manure. Its real price will then be 2 fr. 79 cents, equivalent to 419 kilog. of manure. In the supposition that the whole of this straw equals, in value and in quantity, that of the corn, the total nett produce of the two crops will then be 540 fr. 94 cents, which represent the results of 19,815 kilog. of manure. Its real price will then be 2 fr. 75 cents, equivalent exactly to 10 kilog. of wheat.†

* Compte Rendu de l'Académie des Sciences, tome xiii., p. 331.

† The objection made to this result, in the Royal and Central Society, where the statement was read, was, "that if the labour of the preparation of the ground was not to be reckoned when the question was, the value of a quantity of manure added to a cultivation, which had already taken place, to obtain, no matter what crop, it is not the same as regards the expense of reaping, thrashing, &c.," which, with us amounts to 2 fr. the hectolitre. Thus there would be to deduct for 10 kilog. the eighth-part of the given price, since the hectolitre weighs 80 kilog. and the value of manure will be reduced to 2 fr. 50 cents, instead of 2 fr. 75 cents, and to 9 kilog. 75 of wheat instead of 10. The nature and the price of labour varies so much, that I prefer leaving the cypher, such as it is, in all its generality, leaving to each individual to make these deductions according to local circumstances.

Let us compare this result with that which has been obtained by various authors upon husbandry. Thaër (§ 256, 258) admits that 1000 kilog. of manure puts the soil into a state to produce 70 kilog. of wheat, and, consequently, according to his calculations, 140 kilog. of straw, whose equivalent is, by his manure, of 167, and, therefore, having the value of 84 kilog. of manure, by these means it will only be the quantity of 916 kilog. of manure which will produce 70 kilog. of wheat, which gives us the quantity of 76 kilog. of grain for 1000 of manure, or 7.6 kilog. per 100. We have found 10 kilog., which would lead us to think that our manure is to that of Thaër as 10 : 7.6.

Burger calculates to 1000 kilog. of manure the production of 75 kilog. of wheat and 150 of straw, equivalent to 88 kilog. of manure: thus 912 kilog. of manure producing 75 kilog. of wheat, and 100 kilog. producing 8.2, the manure of Burger would be to ours as 8.2 is to 10.

Kressig admits the produce of 85 kilog., and, consequently, of 170 of straw for 1000 of manure, which may be stated (all deduction made) at 8 kilog., 7 of corn for 100 of manure.

It is plain, then, how much these different valuations approach to those which we have obtained by positive observation. The only point which can be disputed in the method which we have employed is our manner of valuing the straw.

M. Puvis, in a work with which we were unacquainted until after this was published,* attributes to double the weight of straw the same value with that of manure; but it is evident that the straw here is counted only at its own value, and that we cannot attribute to it, over and above, that which it acquires by its mixture of the urine and excrements of the cattle.

2. *Beetroot.*—If beetroot is cultivated upon fresh ground, which does not possess a stock of former manure, 166 kilog. is obtained of this root per 100 kilog. of manure. Higher estimates are mere illusion, and can only arise from the fertility acquired previously by the field.

This result is confirmed by the product of northern cultivation. The cultivators there grow 40,000 kilog. upon grounds which produce 20 hectolitres of wheat; now, 1600 kilog. of grain, resulting from 25,000 kilog. of manure, which, at 165 beetroot for 100, gives 41,000 kilog.

M. Mathieu de Dombasle obtains but the half of this crop from the same quantity of manure;† but then it is upon dry grounds which do not consume all the manure in a first crop.

M. Crud manures his beetroot with 270 metric quintals of manure, and the result is 540 hundred weight of roots; but it is upon his rich land near Boulogne, where the manure has been incorporated for a length of time with the soil.‡

Beetroot repays 1 f. 60 cents in the northern departments, but to this is added 35 kilog. of pulp, which possesses a quarter of the value of beetroot; thus 35 kilog. worth 0 fr. 56 cents, must have 0 fr. 14 cents added to this sum, which then becomes 1 fr. 74 cents per 100 kilog. of beetroot, and the value of the manure 2 fr. 88 cents. We have shewn it to be 2 fr. 75 cents in the culture of wheat on irrigated ground. The agreement could not be more perfect.

3. *Meadows.*—Irrigated meadows, forced to grow several times a-year by successive mowings, and having a continued vegetation, even in winter, appear to be one of the surest methods of discovering the value of manure, and yet it cannot be employed till after having observed attentively what passes in the vegetation of turf. With the exception of some plants, which grow against the interest and the will of the cultivators, those plants of which meadows are composed possess creeping roots, which approach continually to the surface of the ground, according as they are covered by the falling of the foliage, and by the manure which is spread over them. They throw forth fresh radicles, each higher than the preceding—the deeper roots perish and are converted into mould; so that, after its complete formation, however old the meadows may be, its turf (we understand by this, that part of the soil which is covered by the tissue formed by the roots above named) is always of the same thickness, the existence of which, to a certain extent, appears to be essential to the good state of the meadow. This layer of mould is an accumulated richness, but it

* Des Engrais Animaux, 1841. † Annales de Roville, tome vii., p. 255.
‡ Economie de l'Agriculture, § 255.

is placed at a depth that is lost, and which yields its profit to the proprietor o his breaking up his meadow. The grasses of the meadow do not arrive at th development until, by a succession of years, they have formed for themselves, the mineral soil, a bed of azotized mould to nourish their roots; when the turf completely formed, and the roots of the plants still rest upon the mineral soil. latter has not a sufficient natural richness, the crops from the meadows are bu and they do not reach their maximum till after several years of vegetatio numerous manurings, excepting in rich and permeable lands, such as we have spoken of. Until this maximum point is attained, the manure distributed meadows does not produce its full effect, and it is only when it is attained tha can be a hope of seeing its true value reproduced. This proposition will l clearly evident by the detail of what occurs upon the forming fresh meadows. vations of this nature are not wanting under my own eyes.

The surface of the ground is manured before the grass-seed is sown. Th rises apart and straggling, and the surface is but thinly covered for the first the second year the clovers begin to spread, and the grasses to tiller; th year the turf appears formed, but, in reality, it is wanting in the thickness an ness that a meadow ought to possess, and it is so far from having reached it of perfection, that it is only after a considerable number of years, if it is not ed, and if manured, not until after having received a portion of dung that estimated at 5,000 metric quintals per hectare, that the meadow arrives state in which each fresh portion of manure produces its maximum of effect cording to these experiments we may then affirm, that whether we calcul number of years of poor produce in the case of the meadow not being manu whether we reckon the total price of the manure laid on ere the ground can a the point to be desired, there will be per hectare the equivalent of a quantity o metric quintals of manure in advance, supposing that there has been, during t period, crops of hay, equivalent to half of the manure. To estimate the v manure applied to meadow lands, we must then add to the manure that is annually the twentieth part of 2,500 quintals, or 125 quintals, which repres interest of the value of the manure that has been sunk.

In the department of Vaucluse where the land is well cultivated, they ge manure their meadows every third year. Their duration is perpetual; the nat the quality of the herbage go on always increasing in worth. There is cessity, as in Lombardy, to have recourse to the alternate husbandry, from teterioration of their quality. The meadows that are broken up in Italy are pally covered with clover, but the gramineous plants have never time to rea full development. A meadow which I brought gradually to the maximum production in hay, gives me the following result, manured in winter with kilog. of manure, which makes 16,830 kilog. per year, produced—

1st year,	. . .	17,000 kilog. of hay.
2d year,	. . .	15,300
3d year,	. . .	13,600
		45,900
Or per year,	. .	15,300

The price of hay being at 6 fr. the 100 kilog. gives a value of 918 fr. p from 16,830 kilog. of manure, and 12,500 kilog. given in advance, or 29,33 of manure; each 100 kilog. of manure thus produces 52 kilog. of hay, having of 3 frs. 12 cents. We have seen that the manure applied to wheat and to is worth 2 frs. 88 cents. We may perceive how nearly these three valuati proach each other; and which have been obtained in spite of so many circum which rendered it difficult to reach the true value.

4. *Lucerne.*—Is Lucerne a better measure than hay for ascertaining the manure? We are about to see how far we must mistrust it, and to what ar this plant is subject.

Upon a soil that has never borne Lucerne, and which has depth, there obtained a very fine crop of Lucerne without manure. I have seen it succ mirably near Montèlimar, on a gravelly, red, deep soil, which would be the

rines, and without any other manure than gypsum. Lucerne yields also ›d crops in the deep alluvial soils of certain rivers, if these soils are perme- moist without being wet. Upon land which has depth, Lucerne will pro- a with a very small quantity of manure, if the ground has never borne Lu- cre; upon land that has but little depth, Lucerne will give great hopes the , but it will dwindle by degrees as its roots reach the subsoil.

and has already borne Lucerne, once or more times, its decay begins early, ıration is limited to a few years, although the surface of the earth has been ly manured.

'hat this plant appears to prefer is depth of soil, that it may be able con- o push its roots deeper in a soil that contains the aliments conducive to its t. So long as it can find these layers of rich soil placed one upon another, ne continues luxuriant, and does not cease to produce fresh and abun- s. I have remarked, upon the banks of the Rhone and of the Ardeche, ucerne four metres in length.

Lucerne finds a current of air impregnated with the principles of fertility, subdivide in fibrous branches, and it still continues to live during a length but if these roots meet an impermeable layer of soil, or one that is in a state of humidity, kept up by stagnant water, their progress stops, the plant decays, the field becomes barren, the forage has reached the limit of its

ıng does this exhaustion of the deep layers of soil last, which prevents the ous reproduction of Lucerne upon soils which have already grown it? iod depends upon the nature of the culture which may have followed the ucerne. It is shortest in irrigated land; deep ploughing will shorten it in The more the land is permeable the sooner Lucerne may be cultivated same field. In more compact soils, an old agriculturist assured me that, nterval of thirty years, he could still perceive distinctly the places where ıad grown before, by its diminished vigour, and, above all, by its being short livier de Serres allowed fifteen years as the period of duration to a field of I have seen some which had arrived at that age on new land, but now n scarcely five years, and there are many which must be ploughed up the ar. As this plant must necessarily be sown on a deep soil, all the ground erty is not equally fitted for it, from whence results the too frequent repe- his crop upon the same portions of ground. In the rotation of Nimes, recurs in twelve years after having been ploughed up, and there also it is that this time is too short.

g allowance for the injury caused by too late mowing, when the flowering lant is over, we can hardly explain all these facts but by means of two s—that which we have pointed out at the beginning of this article, the for Lucerne to find (in measure, as its root lengthens) fit layers of earth, g nutritive juices. It is well known that, in good soils, this root presents ateral fibres, the absorbing vessels are then placed at its extremity. The pothesis consists in supposing the continuance, during a long succession of hurtful excretions produced by the preceding Lucerne, and which are ible with the existence of this plant, so long as they last; but it would be that the existence of these excretions should be well demonstrated, for us that, during twelve or even thirty years, exposed to the reaction of all the ng bodies, they could have preserved all their hurtful properties. We ink that the exhaustion of the nutritive juices explains quite as well the ıave described, without being exposed to the same objections.

ing from these data, let us examine what passes in the south of France o the culture of Lucerne.

e lands which are not naturally friable, they prepare, by deep ploughing, a e Lucerne plants, permeable to their roots. This depth, in compact soils, may say, the duration of the plant. In four or five years, its tap root out thirty centi-metres of length; and if the subsoil is so hard that it can- netrated, the plant speedily decays and perishes.

tity of manure should then be laid on, sufficient that its mixture with the ther the infiltration of its juices, may reach the lowest layer that the roots to touch. This treatment is indispensable upon land that has already

grown Lucerne, and whose deep layers have been already exhausted. New juices, filtering through the mould, depositing constantly a portion of the vari matters which they contain, do not arrive at any great depth without being co pletely drained of their fertilizing principles. It is this, also, which limits the du tion of Lucerne when it must be treated with artificial manure; and it is likew the case that manure increases extremely the crop in proportion to the quant applied, but does not prolong, in the same proportion, the duration of the pl Besides, farmers dislike burying the manure very deep, from the fear that it n not then be reached by the cereal plants which are sown on a much shallo furrow.

Thus all the success, in ground that is new to Lucerne, depends upon these t things—depth of ploughing and abundance of manure. The first prolongs the du tion of the plant, by giving space for the stretching forth of its roots, and in fa tating the filtering of the juices of the manure into the soil; the second furnishes best nourishment for it.

The first year Lucerne grows luxuriantly with an abundant quantity of manu it finds the quantity of nourishment which it requires. The second year it fi itself still in a zone of soil extremely well fertilized by the juices it has imbibed, an is then that it yields its finest crops. From the third year the diminution beco visible. It is weaker still in the fourth and fifth years; and this diminution is m or less rapid according to the ground being more or less permeable.

But from this tendency of Lucerne to draw its nourishment by the extremity its roots, it results that the manure laid on near the surface of the earth rem almost untouched; and that, after the breaking up of the soil, the ground is i state of richness that proves to what an extent it appropriates to itself the at spherical elements. The crops of wheat which succeed go on exactly as if manure given to the preceding Lucerne had been wholly at the disposal of the cr which succeed it.

Here are some practical results which throw light upon this delicate point.

During five years, a field of Lucerne produced 640 metric quintals of dry fora it had been manured with 1030 quintals of manure; three successive crops wheat were reaped from it, and this mode of culture was stopped only on accoun the abundance of weeds. The soil remained in a very good state, and, after a co plete fallow, two more grain crops were obtained. The total, 102 hectolitres of gr or 160 kilog., which represent the effect of 816 metric quintals of manure. There then, a loss of 214 quintals of manure only, to give 640 quintals of forage. Th crops were raised on ground naturally moist. The loss of manure is much more c siderable on irrigated land, which dissolves more quickly the juices of the man and favours its decomposition.

Lucerne costs, therefore, in manure, 214 quintals, and, in addition, the i total of the manure advanced during six years, the average term of lease, (years of Lucerne and two of cereal crops.) The following is the account of the ture of one hectare, (or two acres):—

Cost of deep ploughing, ...	120 fr.	0 cen
36 kilog. of seed, at 120 fr. the 100, ...	43	20
Five mowings per an., at 8 fr. 50 cents each, during 4 years,	170	0
Spreading, drying, and getting in the forage, . . .	90	0
Rent of land during five years, ...	500	0
204 quintals of manure, at 1 fr. 30 cents, . . .	265	20
Interest of 790 quintals of manure, value 1027 fr. during six years, ...	308	10
	1496 fr.	50 cen

Price of 640 quintals of Lucerne, or per quintal at 2 frs. 34 cents., sellin 6 frs., it is evident that there is a benefit of 2,344 frs. per hectare from this op tion.

If, on the contrary, there had been new land for the Lucerne, the manure lai would have been confined to 600 quintals to favour the first growth of the pl and then the account, changing its figure, 640 quintals, costing 1254, would c only to 1 fr. 96 cents the metric quintal; and on ground where it had not l

y to employ manure, and where gypsum would have sufficed, still less; but s, suffering from the drought of summer, would have yielded a lighter crop

ong digression was necessary to shew why Lucerne refuses to indicate to value of the manure which is applied to its culture. It is a plant that is arvellous—that requires but an advance of manure, which it repays faith- t may be likened to an able miner, who seeks, in the depths of the earth, s of vegetable riches that are hid there, but who, when the mine is ex- soon refuses to continue to penetrate the ground uselessly. It is for these that, after a period of excessive admiration, we see cultivators become dis- with a culture (or crop) which cannot enter into the regular rotation of a mber of years.

annot refrain from reflecting upon the uselessness of the struggle between countries and those where grass grows spontaneously, with regard to the on of live stock. It has been stated that the Prussian agriculturist can ay at 90 cents the 100 kilog.; whereas we, even with the best culture, can ive at producing it at 2 fr. 34 cents, and it is sold at 6 fr. as an average It is only by an assiduous culture that we can establish an equilibrium two countries so differently endowed.

adder.—Every year the cultivation of madder extends to a greater degree epartment of Vaucluse, and a considerable quantity of land has been par- it to cultivators who grow this plant without manure. All the grounds which, ave not borne this root furnish crops which pay the expense of the culture. oil is deep and rich, a second, and sometimes a third, crop is obtained, but ter part of the lands testify their exhaustion after the second year, and then can no longer be advantageously cultivated without manure.

plant has then, like Lucerne, the property of exhausting the soil of those hat are peculiarly adapted to its taste, but which are not the same as those l by Lucerne, since madder succeeds marvellously well where Lucerne has ughed up; and it is a new fact given to aid us in solving the problem of ition of plants which should not be neglected.

ler has been resorted to so frequently upon salt marshes of a calcareous soil, e want of tenacity renders the pulling up cheap, that these lands can no longer madder without manure; whatever remained of natural fecundity for this the ground twenty-five years ago has deceived us, and the analysis of the re- tained led us to believe that 100 kilog. of roots grew from 1300 kilog. of manure. now much nearer the truth, since we may henceforth reckon that we owe all der produced on marshy land to the virtue of manure alone. 1812 kilog. of man- he country is employed, equivalent to 1450 of standard manure, to obtain 100 er. Good cultivators manure a hectare with 72,000 kilog. of manure, equiva- 57,600 kilog. of standard manure, and gather 3,960 kilog. of roots. At the of our first observations upon this subject, the earth must then have contained 50 of nutritive substance, fit for the growth of madder, out of 1300. This n has been exhausted, and the roots now employ, over and above, in manure, refore 100 of manure produce 6.8 kilog. of roots of madder. Supposing this the average price of 75 frs. the 100 kilog., that of the manure employed is then . 10 cents.

beauty of this result explains perfectly how, notwithstanding the consider- vances necessary to be made, notwithstanding the uncertainty of success e large outlay, manure is carefully sought for in those countries where mad- grown, and why they bring it from a distance to employ it in the cultivation plant. It is still bought in some of the neighbouring towns at 1 fr. the quintal, and it acquires a value of 5 fr. employed for madder; but this result ace only upon moist lands, although they are not irrigated. We shall see, in g of dry soils, (which are the most numerous,) that it is very different.

cts upon the Value of Manure employed in the Cultivation of other Crops.—Here ute my own observations made upon the value of manure employed on moist There are still very many facts to collect, but they can only be ascertained by hes so long and so often repeated that I have no hope of being able to termin- m for a length of time. I shall, therefore, confine myself here to detail some s made by others upon the subject that now occupies us.

M. Crud has pointed out, in his last edition of his "Economy of Agriculture," the absorption of manure made by several sorts of plants, although he has not, according to my ideas, pointed out sufficiently the effects produced by the richness of the soil previously acquired, and that added by the manure. It may be useful to collect and compare his observations.

He estimates that one hectolitre of seed of rape absorbs 933 kilog. of manure. M. de Woght makes the quantity of absorption to reach 995. This difference may arise from the different quality of manure, but the variation is not sufficiently great to prevent one of these assertions verifying the other. Taking the average of these given quantities, we admit that, in the moist lands of Boulogne and Holstein, 100 kilog. of manure produces 0115 hectolitres of seed, and at the price of 20 frs. the 100 litres of rape, we shall have 2 frs. 30 cents as the value of a metric quintal of manure employed in this culture. This price is probably inferior to that given for the manure of wheat only, because its quality is not equal to that of the standard manure.

The same M. Crud (§ 228) calculates that 100 kilog. of manure produces 250 kilog. of potatoes. This fact admitted, would give to manure the excessive value of 7 frs. 70 cents. It appears to me exaggerated, and must have depended upon the excellent state of the soils which were cultivated by this writer upon husbandry. M. de Woght estimates that 100 pounds of wheat absorb 1.19 of the richness of the soil, whilst 100 pounds of potatoes absorb only 0.1. According to this observation, and according to the consumption of manure by wheat, 100 pounds of wheat require 1249.5 pounds of manure, which represent the value of 1.19 of the richness of M. de Woght, consequently 0.1 of richness equivalent to 105 pounds of manure, which produce 100 pounds of potatoes: thus, 95 kilog. of potatoes for each 100 kilog. of manure. The hectolitre of potatoes, weighing 65 kilog., is worth, at the average price, 2 frs. 50 cents; we should have 3 frs. 65 cents for the value of 100 kilog. of manure.

Thaër arrives absolutely at the same conclusion; he admits (§ 1265) 44 hectolitres weighing 2,860 kilog., the produce of three cart-loads or 3,000 kilog. of manure, which would also give 95 of potatoes for 100 of manure.

This conclusion appears to me too great, and would seem to indicate that the potato absorbs, besides the manure, a great quantity of juices from the atmosphere, which we must take into our calculations in certain climates; and what appears to prove it is, that, cultivated with different proportions of manure, its produce is almost never relative to their quantity, and that it yields sometimes a larger produce on a broken up lea than on well-manured land. It follows then that this plant is entirely unfit to prove to us the value of manure, and that we cannot depend upon the results which we have quoted.

M. Crud again says that 1500 kilog. of manure has the power of producing 100 kilog. of cleaned hemp, and, consequently, to 100 kilog. of manure a produce of 6 kilog. 6, which, at 1 fr. the kilog., would give 6 fr. 60 cents for the value of the manure employed in the culture of hemp. The excellent state of the hemp fields of Boulogne and the old stock of manure which they contain should make us very cautious how we admit this assertion. M. Oscar Leclerc, to whom we are indebted for some very judicious observations upon the farming of Anjou, informs us* that they manure there, with 2 cubic metres, or 1500 kilog. of manure, a field producing 65 kilog. of cleaned hemp, or 403 of hemp for 100 of manure, which would bring it to the price of 3 frs. 71 cents; it is sold in the country 0 fr. 75 cents the 100 kilog.

III.—*Value of Manure on Dry Lands.*

Under the title of dry lands we understand those which, in the month of August, after eight days' drought, at thirty-three centi-metres of depth, contain at most ten centimes of their weight of water. This is the state of the greater part of the land in the eastern or southern portion of France. There, manure is not immediately absorbed by vegetation, for growth is interrupted by the drought during a part of the year. The manure remains bare, exposed to the influences of the atmosphere, decomposing to a pure loss, and, of course, this loss brings necessarily a great diminution in the value of the manure which is employed there. It varies, of necessity,

* Journal des Progres Agricoles.

the soil, and, above all, according to the climate; thus, nothing is less the following conclusions, which result from observations made in the of the mouths of the Rhone :—

.—The first basis upon which I have fixed my researches on the value as applied to wheat on dry soils, is the extract from the farm-books of de Pomerols, near Tarasion, directed by myself during several years. acts could not suffice, their results diverged too much. One piece of duced a smaller crop the year in which it had been well manured than it had received no manure; sometimes in the same year, if the winter had been dry, there was manifested a general tendency to produce more the unmanured lands than upon those which had been manured. Yet nained evident, which was, that those farms which received a regular nanure, bore crops whose averages were superior, by a certain quantity, ground not manured. There could be no doubt as to the steps to be folle researches which occupied me. It was necessary to unite a great numlts from each of these classes and compare them together, without occulf with the frequent anomalies that a multitude of causes, arising from r and connected with the agriculture, introduce in the individual facts of are composed.

whose greatest fault is this uncertainty in the produce, it can only be by ns on a large scale that we can get rid of these anomalies. In proceedrder was introduced into my researches, and by taking as a whole the manure that I had employed during ten years, and the excessive quaneat produced by its influence, their relation agreed exactly with that t by the actual figures which had been taken from a number of properties cording to different modes of culture.

divided into two classes the domains which have served for our observaose of the first class manure their lands, every fourth year, with an averity of 230 metric quintals per hectare. They have during this time two wheat, each followed by a bare fallow, and produce by these two crops 30 hectolitres of wheat.

f the second class receive no manure, which is reserved for the meadows arden vegetables necessary for the farm, and is insufficient for the wheat at all events, they receive it so seldom, and in such small doses, that the an hardly be calculated. Taken from the same quality of soil as the preese lands produce, in two harvests gathered in four years, from 18 to 20 of wheat per hectare. If sometimes they rise as high as 24 hectolitres often fall to 16, and we may therefore reckon the two first figures as a steady average produce in lands where the fallow is well managed.

en a produce of 10 hectolitres and 800 kilog. of wheat which results from ic quintals of manure, or about 3 kilog. 4. of wheat per 100 manure. The being always supposed at the average price of 22 fr., we obtain 0 fr. 935, ice of 100 kilog. of standard manure. I confine myself for the moment to rk, that this price is inferior to the actual value of this manure.

root.—When the springing of the beet is certain, and that the rains are not f coming towards the end of summer, this crop is one of those which sucon dry soils; but those chances, and the suspension of vegetation in sumce the average produce to about the half of what it is in moist and irrigated 2 fr. 89 cents, it will then be worth 1 fr. 44, employed in the culture of in dry lands; and we remark also, that, upon this species of ground, it has r value when employed for this use than when destined solely for the culreal crops.

dder.—The average produce of madder, treated with 57,600 kilog. of stannure in dry lands, is not more than 1700 kilog.; therefore, we have 100 per 2 kilog. 93 of madder, and the manure is worth 2 fr. 19 cents. This e is a large premium for its employment in this crop; therefore, in those where there is no new ground for madder, manure is carefully sought for ght from a great distance.

e Trees.—It is by the employment of manure in those crops, which, by ration, compensate for the irregularity of the seasons, that the south of finds the means of giving to manure that high value which the dryness of

the soil and the climate would otherwise deprive it of. It has been by a long of observations, that, in my essay upon the culture of olive trees, inserted in vol. of my Collections, I have given to 3 kilog. the produce, in oil, of 100 ki manure. Going upon this basis, we find that the kilog. of oil being at the a price of 1 fr. 60 cents, that of the manure is at 4 fr. 80 cents. The manure is applied to this tree is mostly of a very inferior quality to that of our st manure, but experiments have been made also with the standard manure This mode of employing manure would be a source of riches, if it were not nece limited by the small extent of olive yards, and by the very few plantations th now made.

5. *The Vine.*—I cannot give, as yet, anything beyond approximations as value of manure when applied to the vine. Not any one of the careful culti to whom I have addressed myself, had remarked comparatively the produce o manured and not manured, by keeping notes of the result; they could not gi more than their estimates, based upon their agricultural knowledge, always m less arbitrary.

It is only by comparing these answers that I could form any idea of the which is imputed to manure in the department of the Gard, the country vineyards are cultivated on a large scale. A vineyard producing (wine for th per) will give a crop of of ⅗ overplus when it is manured. The average from vineyards not manured being estimated at 60 hectolitres per hectare, an manure they produce 96 hectolitres.

The manure used is composed of 210 metric quintals of a mixture of dried and of one-fourth of stable manure, which is equal in value to 150 of st manure. This manuring is renewed every third year, during which the vineya have produced of surplus 108 hectolitres of wine, every 108 kilog. of manu have yielded 0 fr. 72 hectolitres of wine, of an average value of 5 fr., or 3 cents per 100 kilog. of manure.

6. *The Mulberry Tree.*—I regret being unable to cite, as yet, any positive r that can shew us the value of manure when applied to mulberry trees—but not be long before I possess them; and everything leads me to think that it less considerable than when applied to the vine. Unfortunately the countri best fitted for the culture of the vine and the mulberry are exactly those wh employment of manure will be limited by its scarcity.

IV.—*Examination of these Results.*

The results which we have obtained by means of standard manure are lows:—

	Moist or Irrigated Lands.		Dry Lands.	
Wheat,	2 fr.	88 cents.	0 fr.	93 cents.
Beetroot,	2	88	1	44
Meadows,	3	12		
Madder,	5	10	2	19
Rape-seed,	2	30		
Potatoes ?				
Hemp ?				
Olive Trees,			4	80
Vines,			4	60

The average selling price of manure is 1 fr. 30 cents, and there is a diffic procuring it, excepting in towns, where the expense of transport must be ad the first cost.

We see by this table, *first*, that moist ground yields more than the double o duct from the same quantity of manure, which is owing to there being no susp of vegetation in such soils; *second*, that the more any crop draws on the advanced at first, the more the returns are distant, and the greater is the of the manure given up to it; *third*, that it is shrubby crops (which see find in the depths of the earth the moisture necessary for vegetation, and gives them the means of prolonging their vigour during the hot seasons) that lish an equilibrium between dry and moist lands as to the value of manure; *fo* that the culture of those plants which pay well for manure gives the true me being able to produce it, and is the greatest encouragement that a country can r

to multiply cattle. Thus, in a country where standard manure is steadily sold at 1 fr. 30 cents, it is produced by the following consummation :—

Oats,	5 kilog.	0 fr. 90 cents.	
Hay,	10	0	60
Straw,	5	0	7
	20 kilog.	1	57

The above producing 40 kilog. of manure, which is worth, at the selling price, 0 f. 52 cents, the food of a horse, then, costs only 1 fr. 5 cents—the price is reduced one-third.

Country horses, fed with excellent hay, and not being habitually fed on oats, as those of waggoners, receive equally 20 kilog. of food—namely,

Hay,	15 kilog.	0 fr. 90 cents.	
Straw,	5	0	7
	20 kilog.	0	97

If we compare, according to the experiments of M. Boussingault, the actual worth of the manures obtained by these two sorts of food, according to the quantity of azote which is contained in them, we shall have, for the first—

		When reduced to Dry Matter.	Contains of Azote.
Oats,	5 kilog.	3 fr. 95 cents.	0087
Hay,	10	7 90	0166
Straw,	5	3 75	0015
			0268

For the second—

Hay,	15 kilog.	11 fr. 85 cents.	0248
Straw,	5	3 75	0015
			0263

The difference is only that of 5,000 parts of azote. The value of the manure is, then, nearly the same by subtracting 0 fr. 52 cents from the price, 0 fr. 97 cents, of the daily allowance of food. We shall have fed our horses for 45 centimes a-day. These facts have only to be known to give a very strong impulse to the breeding of cattle. Is it not true that we hear unceasingly that cattle are a necessary evil—that their expense is always counted a loss? This is not to be wondered at, when we see the greater part of the accounts of expenditure unbalanced by the value of the manure; others, (as Roville,) where they are set down only at 3 fr. the 10 metric quintals—that is to say, at scarcely the third of what they yield to the proprietor, even when employed in the least advantageous manner. In another, (Grignon,) at 2 fr. per 375 kilog. of manure,* or 0 fr. 53 metric quintals—about one-half of their real value. But let the facts which I have stated, and endeavoured to establish, be once brought to light—let the cultivators distinguish the portion of their crops which they owe to the natural fertility of the soil, and that which they have acquired by the addition of manures—and from that moment, understanding their true interests, they will seek to produce this precious matter, of which every kilog. will return to them its given weight of crop, with, moreover, the certainty that they will cultivate better, and that their cultures will be better adapted to each soil and climate.

I shall have attained the end I proposed to myself in writing this essay, if it proves the beginning of so happy a change in the plans of our agriculturists.

* Annales 9e livraison, p. 19.

Experiments in Raising Potatoes with Dung, Rape-cake, (*Guano.* By Mr JOHN GIBSON, Woolmet, Dalkeith.—The foll ing are the results of an experiment of growing potatoes with ferent kinds of manure, in a soil of light loam. The potat were the Buff variety, and they were planted on 20th May, 18

29 falls, Scotch measure, manured with 8 carts of best well-made horse and cow dung, at 8s. per cart, £3 4

Produce 7 bolls (of 4 cwt.) of marketable potatoes, at 10s. per boll,	£3	10	0	
1½ ... of small potatoes, at 6s.	0	9	0	
	£3	19	0	

29 falls manured with 4 carts horse and cow dung, at 8s.	1	12
196 lb. rape-cake, at £6 : 10s. per ton, . . .	0	11
	£2	3

Produce 6½ bolls 2 pecks of marketable potatoes, at 10s. per boll, . .	£3	6	3
1¾ bolls of small potatoes, at 6s. .	0	10	3
	£3	16	6

29 falls, manured with 3½ cwt. of rape-cake, at £6 : 10s. per ton, ... 1 2

Produce 5¾ bolls of marketable potatoes, at 10s. per boll, ...	£2	17	6
1½ bolls 2 pecks of small potatoes, at 6s.	0	9	9
	£3	7	3

ABSTRACT.

	Cost.			Produce.			Difference apparent (	
With dung, ...	£3	4	0	£3	19	0	£0	15
... ½ rape-cake, ½ dung,	2	3	4½	3	18	9	1	15
... rape-cake, ...	1	2	9	3	7	3	2	4

The rape-cake was applied at the rate of 19 cwt. 34 lb. Scots acre.

In 1841, I tried rape-cake on a greater scale, and the re was most satisfactory.

In 1842, it did not succeed so well, from the dry season. compared with guano, it was decidedly inferior; indeed the ter, applied at the rate of 7½ cwt. per Scots acre, produce better crop of turnip than any of the other manures I app that season. In regard to the succeeding crops, no differe could be observed on the wheat after potatoes, as compared v that manured with well-made horse and cow dung; but the l

r turnips, was decidedly better. A mixture of rape-cake did better last year than rape-cake alone.

s *from Buttermilk*. By Miss Neilson, Kirkintilloch. ng seen it observed that it would be useful to Scotch to make cheese from buttermilk, I will give a recipe . obtained from a person while residing in Long Island, in ited States. The contents of my churn I put into a pot, I hung over a slow fire. The buttermilk curdled, and d sunk to the bottom of the pot. I then poured off the ınd worked the curd as I would do other cheese, giving it the taste, which was about half the quantity given to skim-ırd. The curd was then put in a clean coarse linen cloth, ght, and hung from the ceiling to dry for a few weeks, he cheese was fit for use. The linen cloth, when hung in gives a neatness to the appearance of the cheese. If a it of butter be worked into the curd, and the cheese kept se or four months, it will then be very good—at least all ters said so. Cheese can be made in this manner on a ale, even from the produce of one cow. I used to buy ieeses in the market of New York, which I expected would Scotch skim-milk cheese; but on finding them to taste e-milk cheese, I was informed they were made from butter-

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ON SHELTER.

By Mr Donald Bain, Edinburgh.

limits of this Journal are now so reduced, exactly when so ubjects of the utmost importance to agriculture are every ringing up, that I consider it a great privilege to be l to say a few words upon the subject of shelter; because y it may seem merely speculative, though I think I shall efore concluding, that nothing can be less so, and that the on of the readers of the Journal can hardly be more pro- or practically occupied.

true I have already done what I could to introduce the to notice, and even to point out its effects:—On the plains, lucing heavy crops, leading again to heavier, in endless sion; and cattle luxuriating in warmth and pasture, where shelter they must stand shivering on a bleak and barren and in the hills, by representing every spot as rendered tive; as yielding Cheviots in place of Black-faced, and Black-n place of goats and eagles; the hills again populated, so to produce constant attendants for the sheep, and safety

for the shepherds, in place of the desolation and death so of at present, falling upon both. I not only looked to preserving race of the *Mountaineer*, certainly the finest race that we kr both from temper and endurance; but, in the shelter and j tection of the woods, I endeavoured to shew the amount of g that might be raised of all useful kinds, thereby turning e spot of our limited territory, and every blade and every bou to its utmost use, in providing food and shelter for man and beast. I did this; and I have had the approbation, someti the enthusiastic approbation, of many excellent men. But d ing all the late season of distress, when human labour was nothing, and when, consequently, any proprietor with money credit might have turned either to the most profitable accou I have not heard that *one* has thought of employing a sin individual in sheltering the country, even though the propri and profit of the plan has been urged, and publicly urged, *practical men* of great influence as well as intelligence. In th circumstances, it has been suggested to me, from various qu ters, that I should resume the subject, as one well deserving care, and that will certainly yet prosper and repay it; and, obedience to their suggestions, I now do resume it.

If my observations have not already made some impressi it is difficult to say by what art I can succeed in recommend them. It will also be strange; for of all things shelter wo seem a subject that need only be mentioned to recommend it in a country such as this. In regard to the natural body, admit at once the value of this system. In regard to that b indeed, three things in particular are required—dryness, warm and sufficient food; of these three things, the last, or food of course, indispensable to existence—but are not dryness warmth nearly equally so? Nay, with dryness and warmth, individual may live and enjoy comfort with even *insufficient f* but no extent of food could preserve him in health, or even fi death, *without* dryness and warmth.

It is so with the earth, and with all the fruits of the ea and all that live upon it and them. In countries naturally c all animals destined to live in them are endowed with suit coverings, excepting man, and he borrows from the earth from other animals, and in the coldest country surrounds h self with the temperature necessary to his comfort, or he c not prosper. He has only to consider this condition of his existence, to see at once what he ought to do for any plants animals he may find it profitable to rear; unless, indeed, should rather *import a climate* from other countries, as well corn and cattle. In particular instances, we already pay att tion to shelter, in regard to the plants of the garden and hotho and the animals of the menagerie; but as a general principle,

a regard to those plants and those animals it is most important we should care for, we are most recklessly and unphilosophically negligent. Yet this is like being wise in trivial matters and neglecting the weighty points of the law; we care where we are *compelled* to care; where without care the plant or the animal would *die*; but to all short of this we are indifferent, though policy and humanity alike dictate conduct entirely opposite. If fields of corn or flocks of sheep only occasionally perish from want of shelter, though, as a general matter, they *all but* perish, we are contented; we put up with the loss as an effect of climate instead of an effect of negligence; we endure the loss instead of preventing it, and suffer it to be deducted from income when we might add it to it. We do this from habit and heedlessness; yet it is not one bit wiser than it is in the savages of western America to construct themselves mounds on the banks of rivers to which to run when the floods come, and die from famine, so far as they escape the waters, instead of embanking the rivers, as the inhabitants of Holland have done even by the sea. Year after year the savages perish, of course, in thousands, and have their health destroyed to the extent of many thousands more by flood and famine, and the pestilence consequent on both, yet they are untaught, and being now nearly confined to those regions, they will speedily die out, and consider it a natural necessity of their situation; whereas *we* see that there is no natural necessity in the case, but that they are merely unteachable; and, year after year, we have crops wasted and cattle starved from want of shelter, and flocks of sheep buried in snow or carried away by every paltry burn, because there are no proper residences for shepherds to attend them, and no food or shelter to which to drive them on the coming on of floods or storms. To all this we submit, and deduct for such probable casualties from the rents agreed to be paid, instead of removing the casualties; and landlords know and suffer this, though there would be nothing easier than to prevent it. Is not this admirable management? Passing over the inhumanity to the people employed, and the animals thus called into existence to be destroyed or starved, is it not barbarous in an economical point of view? What should we think of a general who should thus suffer his army to be decimated, when by proper care he might prevent it?—of a farmer even, who, by neglecting the precautions he has *agreed* to consider necessary, should allow his crops to be wasted by frost, or his horses by want of stabling? Yet the want of any degree of shelter to crop or stock, that in its results would overpay the cost, is just as barbarous as any of the cases I have supposed. There is little doubt that, from imperfect shelter, there is not only a direct general loss from death or non-production, but also a waste of food

to cattle and of manure for the fields, to an amount scar be calculated.

We may easily be satisfied of this by general reasoning out the test of experiments; for what is the use of shelte what are its effects? Its use, as vegetable life is concer very various. We are all now aware that vegetation deri principal nourishment, not from the earth, but from the from the dews that are constantly falling from the heaver the gases that are ever evolving in or rising from the assisted, of course, by the proper temperature produced sun and earth. Well, how can a blade of corn, or of an imbibe the necessary nourishment from dew or air, or healthful existence, or even live, if perpetually scourged by fying winds? Can we expect *anything* to prosper in such c stances—having neither food, nor warmth, nor rest? We c We see, in consequence, whole fields of the most promising in one night or day, scourged into dry and withered bla smitten to blackness from unbearable cold. These cro recover if the malignant influence shall not be continued to as a man or animal may recover from incipient consum but is not the constitution of both tried and their exi perilled? and if these trials and risks might have been pre ought they not to have been so?

Again,—why is the grass always greenest or the cro luxuriant by the side of a shelter? It is not becaus manure has been applied there, for very probably *no* n whatever has been applied there. But suppose equal ma have been applied, still the question remains, Why is th there both strongest and greenest?—It is because there y see the dew resting, like silver, on every spike, afford nourishment undisturbed, like a mother nursing her infant h nook sheltered from the wind, and only exposed to the su soft and gentle air. To such a corner the hardiest animal is to repair, to feed or ruminate, even in the kindliest season much more when the cold and blighting wind is raging a tempest of rain or snow! And these cold winds rage w much too often, especially in spring, when both plants and a require most to be sheltered from them.

But if in spring shelter is necessary, it is not less *ex* n every season; as not only averting disease from plan animals, but effecting a vast saving of food and energy to

I have lately read, in a most respectable English Journ result apparently of some *experiments* on the very subj which I have been reasoning. They are headed, "*Eff Cold and Heat in Fattening*," and are abridged as follows: well known that cattle do not fatten so well in cold weat

t. The reason is this. The fat is a highly carbonized sub-e, formed by animals from their carbonaceous food. In weather, the carbon in this food is consumed in keeping up ieat of the animal, which is at that season more rapidly *car-off*. This is also illustrated in an experiment made by Lord e at Whitfield. One hundred sheep were placed in a shed, ate twenty-one lbs. of Swedes, each, per day, another red were placed in the open air, and ate twenty-five lbs. of les per day, yet, at the end of a certain period, *the sheep were protected, although they had a fifth less food, weighed lbs. a-head more than the unprotected sheep.* The reason of (it is continued) is obvious: the exposed sheep had their naceous food consumed in keeping up their animal heat," ls, as he has mentioned, from being *carried off* by the air; is long since it has been established, that a man would more weight from being exposed without covering, by ex-ion, than he would in the same time by perspiration, though warmest dress.

Warmth," continues the reporter of these experiments, thus seen to be *an equivalent for food*"—meaning, in this to animals, but I say also to plants; and to both the result *m saving of waste.* "This is also established by the fact two hives of bees do not consume so much honey when her as when separate, on account of the warmth being er. Cattle, from the same reason, thrive much better when warm than when exposed to cold."

The cause of animals getting fat is, that they take in more naceous food than they required for producing animal heat, consequently, it is deposited in the cellular tissue in the of fat." He proceeds, "Fat is an unnatural substance, ts accumulation is not necessary for securing the health of ody; when stored up, however, it will serve the body for ng up its animal heat, and by this means its life, till it is all med. An instance is related of a fat pig having been with-nd 160 days, and still surviving, having been kept alive by n fat."—An explanation, doubtless, how animals of any iption, in good condition, resist both cold and hunger better animals differently situated; and an illustration, at the time, of the fact that, in the great economy of nature, ng is wasted; the surplus food of summer, or any surplus g from any circumstance being thus, as it were, stored up e most convenient form, and in the very substance of the il, against future exigencies.

e have, therefore, thus established, at one and the same time, e the direct advantage and the economy of warmth; for th is not only productive of health and strength to the ani-

mal, but these at a greatly reduced expense of food. Hold the advantage or saving to be only twenty per cent., (and, from the experiment quoted, it is shewn to be greatly more,) and what an immense sum would this be, spread over the flocks and herds maintained by pasture in these kingdoms!

There is another view: the loss of sheep, and lambs in particular, from casualties, including want of warmth; and, from a distinct record of this description now before me, kept by an intelligent shepherd for seventeen years, the mean annual loss of old sheep or hoggs is 20⅓ per cent., or, *again*, upwards of one-fifth! and this without reckoning the loss of lambs, estimated also at twenty per cent.; or, converting the lambs into sheep, raising the per centage in general to twenty-seven per cent. And this last estimate has reference to a southland farm. What the losses are on the unapproachable hills, and in the chasms and gullies of the west and north, has never, perhaps, been attempted to be shewn, but, in their present neglected condition, it may be conceived.

And as gainful as warmth is in the case of animals, it is certainly also in the case of plants—perhaps more so. For though in plants also we find the strong stem can with more probability recover the effects of a blight, it, at the same time, suffers by it with more intensity, and requires, consequently, a corresponding waste of food and energy to recover it, that is, of manure and of sun; which last, though costing no direct expense, is the last thing that should be wasted in this climate, because, in this climate, such waste is ruinous.

And what so contributes to warmth as shelter? What so completely economizes the heat both of the earth and of the sun? And how does it economize both, and the dews and gases they evolve between them? By preserving them from being *swept away*, and by allowing them to be generated in the greatest quantity and of the highest temperature. If we will only walk in the street of a city exposed to the sun, we shall have a perfect example of how the heat is economized and the temperature increased. From reverberation it becomes at last painful, if combined with a moderate degree of calm. In the neighbourhood of a wood facing the sun, or in an enclosure formed by shelters of moderate height, the illustration is both more pleasing and more complete. There the heat is less reverberated. It is absorbed by the earth, and rendered at once more genial and less oppressive. But a moderate degree of heat, thus economized, is indeed of the utmost utility. The air that, between the gases evolved from the earth and the dews that had been deposited from the clouds, may be termed medicated to the plants that require its nourishment, is wasted is not swept away, or dried up; neither is it scorched

or rendered stagnant; but, by moderate shelter, is rendered duly warm; and applied in quiet; and the plant and the animal alike enjoy the genial influence. In short, by shelter we create a climate, and is it necessary to say anything more?

And, as I have already observed in the outset, there is hardly a spot in Scotland, nor, of course, in England or Ireland, that might not be rendered of a kindly temperament by shelter. It is not absolute height that renders our plains and mountains cold, it is merely relative height; that, being the highest, and unsheltered by anything higher, the air passes over them unchecked and unmitigated, and, acquiring strength as it goes, becomes at last scourging and destructive. Upon a surface so swept, the sun can take no effect, nor can the earth impart any warmth; the influence of both is overborne by cold and scourging winds. But where the gale is checked, and the air over any particular spot is rendered tranquil, it soon becomes warm, either from the direct heat of the sun or the latent warmth of the earth. The enclosed space, though on the highest hill, becomes in effect a valley, for it is surounded by higher objects. Its air becomes attempered, its climate and consequently its soil improved; for it becomes the seat of vegetation, and draws nourishment from the previously idle and scourging air; and the blast that was previously destructive, and, like a marauding army, overrun the space, leaving desolation only behind it, is now arrested, and made to yield, to the very woods that arrest it, the nourishment they need; is turned from an enemy, levelling all before it, into a subservient drudge, to yield food and water to the hills, as well as to the plains, and enrich where it had previously impoverished.

Need I say to the intelligent readers of this Journal that this is no fancy picture? No, for every object around them, and every reflection upon it, will convince them of its truth. As I have already said, the lowest plain, if swept by a scourging wind, is barren, or next to barren, whatever may be its soil; and on the other hand, on the highest hills, if we find a valley, it is fertile, precisely because it is not swept by cold and scourging winds.

I might give many instances of this, but every one's reflections will supply them. In the month of July last, the skin was almost cut from my face in riding over the unsheltered district north of Aberdeen, while, in a more elevated region, and greatly farther north, but in the neighbourhood of a plantation, I walked in almost inconvenient warmth, though the day was naturally colder than that of which I had such cause to complain. But the personal convenience or inconvenience of travellers is of little comparative consequence. It is to much more important results I look, and that the country must look, and to these it may look, with confidence. By means of draining and shelter, hundreds of

thousands of acres, at present wholly unproductive, might be added to the pasture, and even the agriculture of the country. Instances of success in this particular, and by these means, are recorded in almost every report from the various parishes of Scotland, embodied in the new statistical account; and as they have been furnished without any reference to the system I would recommend, I consider them particularly valuable. One such instance has just presented itself in the case of the Blackhill of Peterhead, one of the most exposed points in Scotland. The late Alexander Low of Berwickshire had pronounced of it as follows:—"The hill is very worthless, and bids defiance to the plough for improvement." "The hill," says the Statistical Account, "is now nearly all *under a regular system of cultivation, and yields crops nearly equal to the former cultivated lands in the neighbourhood*"—thus, in a single instance, adding 407 acres, which a land valuator had declared to be beyond cure, to the cultivation of the kingdom, and at least £2,400 to its annual revenue.

Draining, trenching, and shelter, have been the means employed in this case; and in the immediate neighbourhood of the sea, and on this most exposed coast, "hardwood," such as "ash, elm, birch, beech, mountain ash, plane and alder, have been planted;" "and, notwithstanding the little extent *and want of shelter, they have risen to a considerable size, and are still thriving.*" Mr Arbuthnot of Invernettie, in this neighbourhood, has also planted, and adds that "the alder, ash, plane, and elm, have *succeeded best.*" He also tried some of the fir tribes, which did not succeed at first; but he now finds that the whole American spruce and silver firs are making strong and healthy shoots."

At the present juncture, when the men who, from some fault or other, may be said to work the blood and bones of English men and English women, and even English children, into their fabrics, would encourage us to lay down our agriculture at the feet of their Moloch of manufactures, I cannot help concluding, for the present, by the following striking narrative from the statistical account of the parish of Tyrie, in the northern part of Aberdeenshire:—

"*Vast, indeed*, have been the improvements made within the last twenty years in the reclaiming of waste and draining of wet lands. These improvements have been carried on by almost every farmer; but *the principal have been the result of the exertions of a number of poor families*, located on various pendicles of what was once a vast and unproductive surface of *moor and moss*. An extensive colony of these are in our immediate neighbourhood and we have had many opportunities of witnessing their exertions. The parents of twenty-nine families, containing 156 indi

viduals, who would otherwise have been held down in the most abject poverty, or been eventually thrown as burdens upon their respective parishes, have been enabled, under the blessing of God, *to bring up their families in comparative comfort, and to look forward to comparative independence under the approaching infirmities of age.* It must be confessed that this cottage or portionary system is yet in its infancy, and its ultimate results cannot be properly foreseen. One great mean of guarding against any apprehended evils would be to extend the duration of the present leases of nineteen years, as all leases for that period are by far too short for improvements, and are obstacles to them. They should be extended to three nineteens at the least."

"Our plantations" (he had said before) "are few, and placed in small irregular *insulated patches*, or in narrow continuous beltings, in the vicinity of New Pitsligo, in the upland district of this parish, and exposed, from their elevated and unprotected position, to every blast that blows. The trees have yet made tolerable progress; and they prove that ash, plane, fir, alder, and mountain ash, the constituent trees of these plantations, are fitted to grow in this quarter." The amount planted appears to be about 270 acres, 40 of which were planted since 1826, at 7,000 trees per acre.

This last, then, shews that even in the moors of Pitsligo, certainly a very hopeless spot, woods can be raised with comparatively little care; for they have not been planted on any system that, strictly speaking, may be deemed proper, nor under circumstances of any peculiar experience. The Rev. Alexander Simpson, the clergyman of this parish, was particularly fond of surrounding himself with wood, and on seeing these papers upon that subject, and being an early friend, regretted he had not entered more deeply into the subject in his statistical account. He did what he could to atone for this in an elaborate private communication, and he promised more "*sed vanæ mortalium spes*." He did not live even to see his statistical account in print; and, the parish being vacant when it appeared, even his name has been suppressed.

> Shall one short hour, to early friendship given,
> Do what a life of virtue had not done?

Meantime he considered the plan I have endeavoured to recommend as invaluable in such districts; and as the recent discoveries of agricultural chemistry make the original soil of comparatively little consequence, particularly as compared with the climate, I cannot but acknowledge myself to be of his opinion. And I think every one will concur in respecting the preceding account of the labours of those industrious agriculturists. In

ground which I know to be of the description usually termed valueless, unassisted by capital or by science, or by almost any human encouragement, it appears they have succeeded in bringing up their families "in comparative comfort," and are now in circumstances to "look forward to comparative independence against the approaching infirmities of age." What would have been their state and prospects had they devoted themselves to *manufactures*, under the present system, instead of this very poor, and, by capitalists, despised agriculture? What? Over-toil, yet misery, disease, and despair! Manufactures may do well, and commerce may do well, for those who can secure the vantage ground in them, and are troubled by no "compunctious visitings of nature" for the condition of those under them; but let us not dream of sacrificing our agriculture for them. This were indeed to pass upon ourselves a *second curse*, and immeasurably increased in its severity beyond the first; for it were to consign ourselves to the sweat of *eternal labour*, without even a chance of thereby eating our bread.

> Ye generous Britains venerate the plough,
> That, o'er your hills and long withdrawing dells,
> Sheds health and plenty o'er a teeming land!

And I trust I have nearly shewn that one of the most powerful auxiliaries of the plough—an auxiliary so powerful as almost to be deemed an equal—is *shelter*.

MEETING OF THE HIGHLAND AND AGRICULTURAL SOCIETY AT DUNDEE IN AUGUST, 1843.

The Annual Meeting of the Highland and Agricultural Society of Scotland was held this year at Dundee, on Tuesday the 8th, Wednesday the 9th, and Thursday the 10th days of August last, in the Barrack Park, immediately behind the Infantry Barracks of Dudhope Castle. As an assemblage of eminent agriculturists and as an exhibition of varied agricultural productions, as also on the score of weather and beauty of locality, it was in no respects inferior to any of the meetings that have heretofore been held under the auspices of the Society. Indeed, from Dundee being chosen, for the first time, as the site of the exhibition and where had never before been witnessed so extensive preparations for such an occasion, there was a new-born interest excited among its inhabitants as well as those in its vicinity. It was

ather remarkable, and certainly highly gratifying, to find the inhabitants of a purely manufacturing town, dependant on its own trade for support, evincing an eager desire to learn the various kinds of stock to be exhibited—to observe them arranging themselves as early as day-break along the streets through which the stock had to pass to the show-yard, in order to obtain a sight of them; and it was still more gratifying to observe the people, in still greater numbers, passing along the streets during the day, with happy faces, enjoying the holiday which had been given them by their employers on account of the show—an indulgence which was eulogized in becoming terms by the noble president, the Duke of Richmond, at the grand dinner in the pavilion, in the evening, in these words:—"He could not refrain from expressing the delight with which he had beheld, in his progress to and from the show, vast numbers of operatives belonging to the town, whose happy faces exhibited a participation in the business of the day; and he felt called upon to express the general feeling of gratitude which was entertained towards the manufacturers of the town of Dundee, in giving a holiday to all their operatives on the occasion. Such was the right way of governing mankind. Give them an opportunity of participating in public holidays, and enjoying freedom whenever it can be done. Maintain the laws with strictness when necessary, but shew at all times your kindly feeling by endeavouring to promote their happiness." From the entire success of the meeting, we take credit to ourselves for being the first to suggest to the inhabitants of Forfarshire, through the columns of the *Dundee Courier* newspaper, Dundee as a suitable place for a Society's Show, even to the selection of the Barrack Park. It is in every respect a preferable site to Perth. It is accessible by sea from every port of the east coast, from John-o'-Groat's to the Nore. Being a large town, it is capable of affording accommodation to a large influx of strangers, and on that account also a sufficient police force can be easily obtained to keep order. Where is there to be found a more beautiful site for an exhibition of the kind than the Barrack Park, where stock can be shewn off to advantage on the gentle slope of the ground, and from which the splendid panoramic view of the Fife hills and the estuary of the Tay, from Norman Law to the ocean, must have struck every stranger with admiration. The town itself was seen to more than usual advantage by the clearness of the air over it, consequent on the numerous chimney-stalks ceasing on that holiday to issue forth their usual complement of dusky vapour. So clear and beautiful a scene, viewed with the accompaniment of a warm sun and cloudless sky, could not fail to infuse

delight to every one. Notwithstanding all these local advanta(we know that the suggestion of a show being held at Dun was deprecated by many as likely to prove a failure. The re has proved the propriety of the suggestion, and for that result community of Dundee is much indebted to Sir John Ogilvy, at an early period readily guaranteed to the Society the fo coming of the necessary sum which induces the Society to in tute a show in any district.

The ground occupied by the show-yard contained fully acres. The fittings were arranged in a somewhat different m ner than usual, and afforded greater facilities for the spectat to view the stock. With the exception of one side of rectangle in which the horses were placed, there was a br space left between the outer fence and the pens for the sto and the superior advantage of this arrangement was, that peo could get before and behind the animals to view them. Short-horns occupied the entire south side of the rectangle, Fife breed, the polled West Highland, Ayrshire, and extra sat occupied the east and north sides, while the horses' stalls w erected along the west side. The Implements were placed i line along the middle of the ground, and were flanked on east end by the breakfast tent, and on the west by the cir erected to accommodate the stock to be sold. The ladies' galle with rooms below for the accommodation of the committee management and judges, were placed in the line of the no range of stock. In front, between the gallery and impleme was the stage for walking the prize stock along, and nouncing from which the names of the successful competit whilst the shed for the exhibition of butter and cheese, ro seeds, and plants, was placed still further in front betw the Short-horns and implements. In a line to the westward the stage were the pens for Leicester sheep, and on the w those for Swine. In a line, to the westward of the shed conta ing the roots and seeds, were the pens of Southdown, Black-fac and Cheviot sheep, and on the east the cribs for Poultry—a r feature in these shows. Tanks of water, with buckets for s plying them with drinking water, completed the arrangeme for the stock. There was one gate of entrance for stock in east corner, another at the north, and a third at the w corner. The entrances for the public consisted of one for reception of the ladies from their carriages immediately beh the gallery from the Dudhope road, two entrances at the no east corner, two at the south-east, two at the south-west er, and one for egress only at the east side. These nume gates for ingress and egress were made to obviate the usual

of detaining the public too long of getting in at the gates, o of the impossibility of getting out before the usual time he gates are thrown open to the public, and the stock owed to depart.

e was entered for exhibition 73 horses, 317 cattle, 324 30 swine, and 34 poultry, in all 778 head of live stock. were, besides, 31 lots of dairy produce, several fleeces of collections of seeds and plants, and 43 exhibitors of im- ts presenting 101 sets of articles.

business of the meeting commenced, on Tuesday forenoon, ie exhibition of dairy produce, comprising butter, and nd skimmed milk cheese, roots, plants, seeds, and imple- and the premiums were awarded for these on that day in o lighten the business of the following one. At noon, on y, the general committee met in the Town Hall, under the ncy of Sir John Ogilvy, and appointed the judges of the ive classes of stock, as also the numerous sub-committees, d various duties to execute on the show-day, such as enter- stock into their respective pens, attending the judges the execution of their labours, collecting the money at the exhibiting the prize stock, &c. By this time all the officials ed to conduct the business of the show had arrived in town, l taken possession of the accommodation provided for them British and Royal Hotels—at the former of which were ie head-quarters of the Society. At six o'clock, the Direc- ner, open only to members of the Society, took place in the Hall, Union Street, under the presidency of the Earl of ld, Sir John Ogilvy, croupier, when about 150 sat down mptuous entertainment, provided by the joint exertions Messrs Stewart of these hotels. In the evening a ball was the New Exchange Buildings, the proprietors of which nely gave the use for the purpose. The room was as l as a floor should be for dancing, there being, probably, er than four or five hundred persons present. Stewart's om Edinburgh supplied the music, which was good, and etherspoon presented, in an ante-room, a choice display of l confections and fruit. This was the pleasantest ball seen on any similar occasion, and no wonder it was with spirit until a late hour of the morning.

were the names of the judges selected to examine the of the various kinds of stock:—

hort-horned Breed of Cattle.—Mr Heriot of Fellowhills, Berwickshire; of Burton, Yorkshire; Mr Bartholomew of Goltho, Lincolnshire; and Captain Howard.

Of the Polled Breed.—Mr Craig, Bighouse, Sutherlandshire; Mr Watt, Balb Fifeshire; and Mr Watt, Clentray, Fifeshire.

Of the Fife Breed.—The same judges as the polled breed.

Of the West Highland Breed.—Mr Lorne Campbell, Roseneath, Argyleshire, a Mr Robert Carmichael, Raploch Farm, Stirlingshire.

Of the Dairy Cows.—Mr M'Callum, Plewlands, Mid-Lothian; Mr Black, Smeato Dalkeith Park, Mid-Lothian; and Mr Alexander of Southbar, Renfrewshire.

Of any Breed.—The Hon. Captain Howard and Mr Charge.

Of the Leicester Breed of Sheep.—Mr Heriot and Mr Bartholomew.

Of the Southdown Breed.—Mr Heriot, Mr Charge, and Mr Bartholomew.

Of the Black-faced Breed.—Mr Lorne Campbell and Mr Carmichael.

Of the Cheriot Breed.—Mr Murray, Drochel Castle, Peeblesshire, and Mr Crai

Of any Breed.—Mr Bartholomew and Mr Charge.

Of Horses.—Mr Fawcett, Scaleby Castle, Cumberland, and Professor Did Edinburgh.

Of Pigs.—Mr Thomson, Highridge Hall, Roxburghshire, and Mr Wetherel Durham.

Of Poultry.—Mr Muirhead, Edinburgh.

Of Dairy Produce.—Mr Peter Stewart, Dundee; Mr Robert Nichol, Dundee Mr Curr, Dundee; and Mr Drummond, Craigie, Forfarshire.

Of Extra Cattle and Sheep.—Mr Carmichael, Mr Craig, and Mr Lorne Campbel

Of Extra Horses.—The same judges as of the competing horses.

Of Extra Pigs.—The same judges as of the competing pigs.

Of Roots and Seeds.—Mr David Miln, Dundee; Mr Drummond.

Of Implements.—Mr Macpherson Grant, younger of Ballindalloch, Banffshire Mr Smith, late of Deanston; Mr Stirling, Dundee; Mr Slight, Curator of th Society's Models, Edinburgh.

By four in the morning the stock were on their way to th show-yard; by eight they were all safely placed in their respec tive pens, for the inspection of the judges, who then began thei arduous duties; by eleven the ladies were admitted into the gallery as also every person into the yard who paid half-a-crown, of which privilege very many availed themselves; and, by one, the gene ral public were admitted at a shilling each person. On this day £788 were collected at all the gates. On the preceding and subsequent days, about £80 were collected at one shilling each person. So it is probable that from 12,000 to 13,000 persons paid at the gates on the show day and about 1000 on each o the other days. The sun rose bright, and continued to shine with unclouded lustre throughout the day, and thus added one more to the list of fine days that have now been experienced at th shows of the Society for the last one-and-twenty years. As th judges finished their tasks, they tendered their awards to th directors, and the results of their decisions will be found below under their respective heads.

I. Cattle.

1. *Short-horn Breed.*

Of this class there were exhibited 19 aged bulls, 10 two-year-ol ..lls, 22 one-year-old bulls, 10 cows, 7 pairs of cows, 6 pairs

old heifers, 15 one-year old heifers, 2 pairs of three-year-old pair of two-year-old oxen, and 4 single oxen, entered as e class of any breed : in all, 122 pure-bred Short-horns ber much exceeding what might have been expected to ted together in any midland district of Scotland—and, y and uniformity of character, excelling those of the ss exhibited last year at Edinburgh. The awards of the s in this class were :—

best Bull, calved after 1st January, 1837—the premium of fifty sove- No. 7, George A. Grey, Esq., Millfield Hill, county of Northumberland.
second best ditto—the premium of twenty sovereigns, to No. 10, Mr l, Edenhall, county of Cumberland.
norary silver medal to Mr Atkinson of Peepy, Northumberland, as the the best bull.
best bull, calved after 1st January, 1841—the premium of twenty sove- No. 6, Mr Nicol Milne, Faldenside, county of Roxburgh.
ond premium of ten sovereigns, to No. 10, Mr Hugh Watson, Keillor, Forfar.
best bull, calved after 1st January, 1842—the premium of twenty sove- No. 12, Mr Alexander Geekie of Baldowrie, county of Forfar.
e best Cow—the premium of fifteen sovereigns, to No. 4, Mr Lewis Kirkhill, county of Kincardine.
second best ditto—the premium of seven sovereigns, to No. 15, Mr Ballumbie, county of Forfar.
best two Cows—the premium of ten sovereigns, to No. 1, the Duke of h.
best two Heifers—calved after 1st January, 1841—the premium of ten s, to No. 3, Mr Amos Cruickshank, Syttyton, county of Aberdeen.
second best two ditto—the premium of five sovereigns, to No. 6, Mr atson, Keillor, county of Forfar.
best Heifer, calved after 1st January, 1842—the premium of ten sove- No. 3, the said Mr Amos Cruickshank, Syttyton.
second best ditto—the premium of five sovereigns, to No. 13, Mr James Wester Fintray, Aberdeen.
e best two Oxen, calved after 1st January, 1840—the premium of ten s, to No. 2, Mr Miller of Ballumbie.
e second best two ditto—the premium of five sovereigns, to No. 1, Mr od, Hatton of Eassie, county of Forfar.
e best two Oxen, calved after 1st January, 1841—only one lot exhibited, to the Duke of Buccleuch. Not being deemed worthy of the whole pre- e half, being five sovereigns, was voted.

career of the two prize aged bulls is remarkable. Mr ull, after gaining the second prize at Dundee on the 11th , gained the first prize at the Northumberland Agricul- ociety's Show at Hexham, on Tuesday, 29th August, and ined the only prize and cup at the show of the Royal ltural Society of Ireland at Belfast, on Monday, 31st , there beating Mr Grey's bull which obtained the first t Dundee. So, with Mr Grey's bull, it gained the first t the Border Union Show at Kelso, in April last, was de- at Tyne-side, gained the first prize at Dundee, and was

highly commended at Belfast. The pedigrees of some of the prize Short-horns are those :—

Mr Grey's *Recruit*—got by Gainford, 2044; dam Leopoldine, 265, by Sir Walter, 2639; g. d. Blossom, 285, by Marquis, 2270; g. g. d. Leopoldine, 460, by Wellington, 2824; g. g. g. d. by Leopold, 2199; g. g. g. g. d. by Dundas, 1948; g. g. g. g. g. d. by Cupid, 177; g. g. g. g. g. g. d. by Simon, 590; g. g. g. g. g. g. g. d. by Punch, 531; g. g. g. g. g. g. g. g. d. by Bolingbroke, 86. He was bred by Mr Atkinson of Peepy, Northumberland, and was purchased from him in May, 1841.

Mr David Hill's *Eden*—got by Gainford, 2044; dam Countess, by Blandon; g. d. Bright Eyes, by Hastings; g. g. d. Mayflower, by Hector, 1961; g. g. g. d. by Barmpton, 54; Whitenose, 692; George, 275; Ben, 70; Favorite, 252; Chapman's son of Punch, 122. He was bred by the Earl of Lonsdale, and purchased from him in March, 1843.

Mr Milne's *Ethelred*—got by the Earl; dam Emely by Comet, 1854; g. d. by Eclipse, 1949; g. g. d. Elvira by Duke, 1933; g. g. g. d. by Wellington, 2840; g. g. g. g. d. by Young Remus, 2522; g. g. g. g. g. d. by Midas, 435; g. g. g. g. g. g. d. by Traveller, 655; g. g. g. g. g. g. g. d. by Bolingbroke, 86. The Earl by Gainford, 2044; dam Marchioness by Eclipse, 1949; g. d. Countess by Sir Charles, 593; g. g. d. Princess by St Albans, 1412, &c. He was bred by Mr Thomas Croften, Holywell, Durham, and purchased from him in March, 1843.

Mr Watson's Bull—got by Clementi; dam Violet, by Slashing Harry; dam Velvet, by a son of Rob Roy, 557; g. d. by Pirate, 2430; g. g. d. by Young Houghton, 1119; g. g. g. d. by Newton, 1271; g. g. g. g. d. by Sidbury, 1424. He was bred by Mr Watson at Keillor, Forfarshire.

Mr Geekie's *Strathmore*—by the Baron; dam Diana, by Monarch; g. d. Mayflower, by Invalid; g. g. d. Rosebud, by St Leger, 1420; g. g. g. d. by Comus; g. g. g. g. d. by Denton, 198; g. g. g. g. g. d. by Henry, 301. He was bred by Mr Geekie at Baldowrie, Forfarshire.

Mr Crombie's *Playful*—got by Frederick, by Sir Walter, 2639; dam Peggy, by Favourite, (vol. iii. p. 726,) g. d. by Studley, 628; g. g. d. Laura, by Triune, 1661; g. g. g. d. by Major, 397; g. g. g. g. d. by a son of Waddingworth, 669. She was bred by Mr John Parkinson, Crossfields, Nottinghamshire, purchased from him in September, 1841.

Mr Cruickshanks' *Dahlia*—got by Soldier; d. by Commodore, g. d. by Commodore; g. g. d. by Mr Colling's Major. *Lady Picton*, got by General Picton; dam Sunflower, by a son of Sovereign; g. d. by Sovereign. Sovereign bred by Captain Barclay; dam Lady Sarah, by Monarch; g. d. by Satellite, 1420; g. g. d. by Jupiter, 342; g. g. g. d. by George, 278; g. g. g. g. d. by Chilton, 150; g. g. g. g. g. d. by Irishman, 329; g. g. g. g. g. g. d. by B. 46. General Picton by Aemon, 1690; d. Young Denton (vol. iii., p. 344,) by Young Rockingham, 2547; g. d. by Denton, 198; g. g. d. by Landrone, 353; g. g. g. d. by Henry, 301; g. g. g. g. d. by Dasby, 190; &c. *Dahlia* was bred by Mr Cruickshanks at Syttyton, Aberdeenshire, and *Lady Picton* was bred by Mr Christopher Coates, Yorkshire, and purchased from him in May, 1842.

Mr Watson's two-year-old Heifer—sire Baron; dam Ranunculus, by Conservative. One year and ten months' old heifer; sire Major; dam Bellerophon (F.,) by Belvidere, 1706; by Waterloo, 2816; by young Wynard, 2809; by Irishman, 329; by Mr Robert Colling's Styford, 629. Both bred by Mr Watson at Keillor, Forfarshire.

Mr Cruikshanks' *Matchless*—got by Holkar; d. Premium, by George, 2687, the son of Mr Chrisp's Old Princess, by St Albans; g. d. by Mr Porrit's Togston; g. g. d. bred by Mr Laing, Longhouton; Holkar bred by Mr Thomas Bates, got Belvidere, 1706; d. and g. d. by Mr Bates' second Hubback, 1423, &c. She was bred by Mr Cruickshanks at Syttyton, Aberdeenshire.

2. *Polled Breeds.*

Of this class there were entered for competition, 14 aged bulls, [illegible] two year old bulls, [illegible] one year old bulls, [illegible] single cows, [illegible]

of 3 cows each, 6 pairs of two-year-old heifers, 3 pairs of one-year- heifers, 3 pairs of four-year-old oxen, 2 pairs of three-year-old , 3 lots of oxen of 3 each lot, and 1 cow and 3 calves in the s of extra stock. In all 88 head. As Forfarshire is the rict of this breed of stock, it was expected that the specimens m would be good; and, accordingly, they were so, and re- ted high credit on their native county. Indeed there was a -year-old Angus ox, of Mr Hugh Watson, the most perfect mal of the kind we ever saw, so much so, that it would be icult to find a single fault to him. He gained the premium his class at the Irish Society's Show at Belfast on 31st August. ere is a test of purity of breeding, too, which he possessed, nely, the absence of all white—black and all black. So sure his test, that, when Angus cattle display the least speck of ite upon them, we would have no hesitation in pronouncing em contaminated with impure blood. In like manner, a single ck hair would render the blood of Short-horns suspicious. ese were the awards of the premiums of this class:—

For the best Bull, calved after the 1st January, 1837—the premium of twenty ereigns, to No. 6, Mr William Fullerton, Mains of Ardovie, county of Forfar.

For the second best ditto—the premium of ten sovereigns, to No. 12, Mr Alex- ler Ronaldson, Littlegight, county of Aberdeen.

The honorary silver medal was voted to the *Breeder* of the best Bull.

For the best Bull, calved after 1st January, 1841—the premium of fifteen sove- gns, to No. 2, Mr Hugh Watson, Keillor.

For the second best ditto—the premium of eight sovereigns, to No. 1, Mr Robert lker, Portlethen Mains, county of Kincardine.

For the best Bull, calved after 1st January, 1842—the premium of ten sovereigns, No. 3, Mr Hugh Watson, Keillor.

For the second best ditto—the premium of five sovereigns, to No. 1, Sir Thomas rnett, Bart. of Leys, county of Kincardine.

For the best Cow—the premium of ten sovereigns, to No. 1, Colonel Dalgairns of lgavies, county of Forfar.

For the second best ditto—the premium of seven sovereigns, to No. 3, Mr Robert ctor, Ferneyflat, county of Kincardine.

For the best three Cows—the premium of ten sovereigns, to No. 1, Mr William llerton, Mains of Ardovie, county of Forfar.

For the best two Heifers, calved after 1st January, 1841—the premium of eight ereigns, to No. 4, Mr Hugh Watson, Keillor.

For the second best two ditto—the premium of five sovereigns, to No. 2, Mr mes Mustard, Leuchland, county of Forfar.

For the best two Heifers, calved after 1st January, 1842—the premium of seven ereigns, to No. 3, Mr Hugh Watson, Keillor.

For the best two Oxen, calved after 1st January, 1839—the premium of ten ereigns, to No. 1, Lord Panmure, Brechin Castle.

For the second best two ditto—the premium of seven sovereigns, to No. 3, Mr gh Watson, Keillor.

For the best two Oxen, calved after 1st January, 1840—the premium of eight ereigns, to No. 2, Mr Robert Lyall, Old Montrose, county of Forfar.

For the second best two ditto—the premium of five sovereigns, to No. 1, the said r Robert Lyall.

For the best three Oxen, calved after 1st January, 1841—the premium of five ereigns, to No. 1, Mr Thomas Collier, Hatton.

The aged Angus bull of Mr Fullerton, named *Panmure*, was

bred by Lord Panmure, and purchased from his Lordship in October, 1841. Mr Ronaldson's aged Aberdeen bull was bred by Mr Walker, Monbleton, and purchased from Mr Prot, Meikle Colp, both places, we presume, in Aberdeenshire. The portrait of one of the lot of 3 cows, belonging to Mr Robert Walker, Portlethen Mains, Kincardineshire, was recommended to be taken for the Society's Gallery of Pictures in Edinburgh, and Mr Gourlay Steell, A.R.S.A., Edinburgh, was appointed to execute the commission.

3. *Fife Breed.*

Of aged bulls there were 6 entered in competition, 1 two-year-old bull, 7 pairs of cows, 1 pair of two-year-old heifers, 1 pair of one-year-old heifers, 2 pairs of four and three-year-old oxen, 1 lot of 3 of two-year-old oxen, and of extra stock 8 oxen and 1 cow—making in all 41 head—a small number considering the proximity of the county to the place of show. But, somehow, the Fife breed always turns out sparingly at the Society's Shows, whether from want of numbers or unwillingness on the part of the breeders to exhibit we cannot say. The awards of premiums were as follows :—

For the best Bull, calved after 1st January, 1839—the premium of twenty sovereigns, to No. 4, Mr James Landale, Woodmill, county of Fife.

For the second best ditto—the premium of ten sovereigns, to No. 1, Mr Andrew Aitken, Carnbee, county of Fife.

To the said Mr Landale, as the breeder of the best Bull.

For the best Bull, calved after 1st January, 1841—the premium of ten sovereigns to No. 1, F. Wedderburn, Esq. of Birkhill, county of Fife.

For the best two Cows—the premium of ten sovereigns, to No. 3, Mr George Brown, Balgarvie, county of Fife.

For the second best two ditto—the premium of seven sovereigns, to No. 7, Mr David Wallace, Balgrummo, county of Fife.

For the best two Heifers, calved after 1st January, 1841—no competition.

For the best two Heifers, calved after 1st January, 1842—the premium of five sovereigns, to No. 1, Mr George Brown, Balgarvie, county of Fife.

For the best two Oxen, calved after 1st January, 1839—the premium of ten sovereigns, to No. 1, Mr David Wallace, Balgrummo, county of Fife.

For the second best two ditto—the premium of seven sovereigns, to No. 2, the said Mr David Wallace.

For the best three Oxen, calved after 1st January, 1841—the premium of five sovereigns, to No. 1, the said Mr David Wallace.

4. *West Highland Breed.*

There were only 3 aged bulls entered in competition, 4 cows, 2 three-year-old heifers, 2 four-year-old oxen, 2 lots of 3 each of two-year-old oxen, and 1 ox and 3 cows amongst the extra stock—amounting, in all, to only 21 animals; but a large exhibition of this kind of stock was not to be expected in that part of the country. The Marquis of Breadalbane was the principal exhibitor in this class. The awards of the premiums were thus :

For the best Bull, calved after 1st January, 1836—the premium of twenty sovereigns, to No. 2, Mr William Grant, county of Banff.
For the second best ditto—the premium of ten sovereigns, to No. 3, the said Mr William Grant.
To Mr Grant, as the breeder of the best Bull in this class, the silver medal.
For the best Cow, calved after 1st January, 1836—the premium of eight sovereigns, to No. 2, the Marquis of Breadalbane, Taymouth Castle, Perthshire.
For the second best ditto—the premium of five sovereigns, to No. 4, Mr Patrick Small, Dirnanean, county of Perth.
For the best two Heifers, calved after 1st January, 1840—the premium of seven sovereigns, to No. 1, the Marquis of Breadalbane.
For the best two Oxen, calved after 1st January, 1839—the premium of ten sovereigns, to No. 1, the Earl of Mansfield, Scoon Palace, Perthshire.
For the best three Oxen, calved after 1st January, 1841—the premium of five sovereigns, to No. 1, the Marquis of Breadalbane.

5. *Dairy Cows of any Breed, Pure or Cross.*

This was a comparison of all breeds as dairy cows, comprising 9 in number in competition, and 5 in the extra stock—in all 14. It will be observed, from the awards, that the Ayrshire cows carried all the three premiums.

For the best Dairy Cow of any breed, pure or cross—the premium of ten sovereigns, to No. 1, the Earl of Mansfield.
For the second best ditto—the premium of seven sovereigns, to No. 2, the Earl of Mansfield.
For the third best ditto—the premium of five sovereigns, to No. 16, Mr Thomas Ross, Quinzie Burn, Stirlingshire.

6. *Oxen of any Breed, Pure or Cross.*

There were 7 four-year-old fat oxen entered in competition, and 6 in the extra stock—in all 13.

For the best Ox of any breed, pure or cross, shewing most symmetry, weight, and fat, calved after 1st January, 1839—the premium of ten sovereigns, to No. 4 Mr John Millar of Ballumbie.
For the second best ditto—the premium of seven sovereigns, to No. 5, Mr W. D. Proctor, Glammis.

Mr Millar's ox was a very fine animal, and, on applying the tape line, we found his dimensions to be in girth nine feet three inches and in length six feet; giving a weight of beef, sinking the offals, of 120 stones imperial. We conceive that the competition in this class confirms the belief that, when oxen are brought nearest the point of maturity they can reach, that is, to *ripeness*, the pure blood will excell every cross in fatness, symmetry, and quality. Mr Watson's Angus ox, alluded to above, is another instance illustrative of this principle.

II. Horses.

The premiums at the Society's Shows are usually restricted to horses for agricultural purposes; the other classes of horses

being usually comprehended amongst the extra stock. Of aged stallions for agricultural purposes there were entered in competition 17; of three-year-old entire colts there were 6; of two-year-old entire colts 7—in all 30 stallions. There were of brood mares 14, and 12 two-year-old fillies; making a total of 56 breeding horses for agricultural purposes. Amongst the aged stallions there were none of striking appearance for shape or action, but there were some half-dozen of very fine mares. The short-legged brown mare belonging to Mr Thomas Scott, Easter Cadder, Lanarkshire, we should have preferred to breed from, to either of the two which obtained the premiums. There were a number of capital fillies, one of which, that obtained a premium, was bred in Forfarshire. The award of the premiums were as follows:—

For the best Stallion, under ten years old—the premium of forty sovereigns, to No. 12, Mr George Paton, Bankhead, county of Renfrew.

For the second best ditto—the premium of thirty sovereigns, to No. 7, Mr Richard Hogg, New Blainslie, county of Roxburgh.

For the best Stallion, foaled after 1st January, 1840—the premium of twenty sovereigns, to No. 1, Mr Andrew Aitken, Carnbee, county of Fife.

For the best Stallion, foaled after 1st January, 1841—the premium of ten sovereigns, to No. 2, Mr Andrew Dudgeon, Falkland Wood, county of Fife.

For the best Mare—the premium of fifteen sovereigns, to No. 8, Mr Thomas Gowans, Addinbrae, county of Edinburgh.

For the second best ditto—the premium of ten sovereigns, to No. 10, Mr Robert Murdoch, Haughhead, county of Lanark.

For the best two-year-old Filly—the premium of ten sovereigns, to No. 16, Mr William Tod, Elphingstone Tower, county of Haddington.

For the second best ditto—the premium of seven sovereigns, to No. 9, Mr James Steele, Ingliston, county of Forfar.

III. Sheep.

1. *Leicester Breed.*

Of this breed there was a good show, and fully as numerous as could be expected so far north of the Forth. There were 26 aged tups, 30 shearling tups, 16 pens of ewes of 3 each, 12 pens of gimmers of 3 each, 2 pens of wethers of 5 each, and 1 tup amongst the extra stock, making a total of 151 animals. The premiums awarded were as follows:—

For the best Tup, lambed after 1st January, 1839—the premium of twenty sovereigns, to No. 19, Mr Thomas Simpson, Blainslie, county of Roxburgh.

For the second best ditto—the premium of ten sovereigns, to No. 11, Mr Alexander Geekie, Baldowrie, county of Forfar.

For the best Shearling Tup—the premium of twenty sovereigns, to No. 24, Mr William Smith, Burton, county of Northumberland.

For the second best ditto—the premium of ten sovereigns, to No. 4, Sir Thomas Moncrieffe, Bart., of Moncrieffe, Perthshire.

For the best pen of three Ewes—the premium of seven sovereigns, to No. 15, Mr Hugh Watson, Keillor.

For the second best ditto—the premium of five sovereigns, to No. 13, Mr Hugh Watson, Keillor.

For the best pen of three Gimmers—the premium of seven sovereigns, to No. 5, Mr Alexander Geekie of Baldowrie.

For the second best ditto—the premium of five sovereigns, to No. 11, Mr Hugh Watson, Keillor.

For the best pen of five Wethers, not exceeding twenty months old—the premium of five sovereigns, to No. 2, Mr Millar of Ballumbie.

2. *Southdown Breed.*

This breed is rather a novel feature in the exhibition of stock in Scotland. On this occasion the show was good, if not extensive, though we believe that Forfarshire contains the largest flock of Southdowns in Scotland. Mr Watson of Keillor has now possessed them for upwards of twenty years, and has found them, in the middle green range of the Sidlaw Hills, as *hardy*, and, being so, a superior stock to the Cheviot in the same circumstances. The numbers entered in competition were of aged tups 4, of shearling tups 4, four pairs of ewes of 3 each, five pairs of gimmers of 3 each, and amongst the extra stock there were 3 tups, making a total of 38 animals. Mr Jonas Webb, of Babraham, in Cambridgeshire, was kind enough to send a few lots of tups all the distance—not less than 400 miles. The portrait of one of his shearling tups was taken on the spot by Mr Gourlay Steell, for the Society's Museum. The awards of the premiums were thus:

For the best aged Tup—the premium of ten sovereigns, to No. 1, the Duke of Richmond.

For the best Shearling Tup—the premium of ten sovereigns, to No. 3, Mr Jonas Webb, Babraham, county of Cambridge.

For the best three Ewes—the premium of seven sovereigns, to No. 2, Mr Hugh Watson, Keillor.

For the best three Gimmers—the premium of five sovereigns, to No. 5, Mr Hugh Watson, Keillor.

3. *Black-faced Breed.*

This breed might have presented a more conspicuous figure in the exhibition than they did, either as to number or quality, both as to breeding stock or wethers. There were 3 lots of 3 each of aged tups, 2 lots of 5 each of ewes, 2 lots of 5 each of gimmers, 8 lots of 5 each of four-year-old wethers, 1 lot of 5 five-year-old wethers, and 20 sheep amongst the extra stock, making a total of 94 sheep. The premiums for them were awarded thus:—

For the best three aged Tups—the premium of ten sovereigns, to No. 2, Mr James Deans, Mitchell Hill, county of Peebles.

For the second best three ditto—the premium of five sovereigns, to No. 3, Mr James Welsh, Earlshall, county of Dumfries.

For the best five Ewes—the premium of five sovereigns, to No. 1, Mr John Collier, Panlathie, county of Forfar.

For the second best five ditto—the premium of three sovereigns, to No. 2, Mr J. Falconer, Balnakettle, county of Kincardine.

For the best five Gimmers—the premium of five sovereigns, to No. 1, Mr John Collier, Panlathie.

For the second best five ditto—the premium of three sovereigns, to No. 2, Mr Patrick Small of Dirnanean, Perthshire.

For the best five Wethers, lambed after 1st January, 1839—the premium of five sovereigns, to No. 6, Mr David Scott, Northfield, East Lothian.

For the best five Wethers, lambed after 1st January, 1838—the premium of five sovereigns, to No. 1, Mr Millar of Ballumbie.

4. *Cheviot Breed.*

This district has never been famed for Cheviot sheep. Very few are bred, and not many fed in it. Accordingly, all the Cheviot sheep entered in competition came from a distance. There were 2 lots of 3 each of aged tups, 1 lot of 5 of ewes, 2 lots of 5 each of gimmers, 2 lots of 5 each of wethers, and none entered as extra stock, making in all 31 animals. The awards of the premiums were as follows:—

For the best three Tups—the premium of ten sovereigns, to No. 1, Mr William Aitchison, Menzion, county of Peebles.

For the best five Ewes—the premium of five sovereigns, to No. 1, the said Mr William Aitchison.

For the best five Gimmers—the premium of five sovereigns, to No. 1, the said Mr William Aitchison.

For the best five Wethers, lambed after 1st January, 1839—the premium of five sovereigns, to No. 1, the Duke of Northumberland.

5. *Any Breed of Wethers, Pure or Cross.*

Of these there were 2 lots of 5 each of Leicesters, and 1 lot of 5 of a cross between the Southdown ewe and Leicester tup. The premium was gained by the Leicesters, holding good amongst sheep what we have said of cattle, that of aged animals the pure blood will always excel. The premium was thus awarded:—

For the best pen of five Wethers, of any breed or cross of most value to the grazier, quality of wool and mutton considered—the premium of five sovereigns, to No. 2, Mr Millar of Ballumbie.

IV. Swine.

There were 9 boars, 8 sows, 2 lots of 3 each of pigs under ten months old, 2 pigs belonging to cottagers, and 5 pigs amongst the extra stock, in all 30 swine, and the premiums for them were thus awarded:—

For the best Boar—the premium of five sovereigns, to No. 5, Mr John Mitchell, Cupar, county of Fife.

For the best Sow—the premium of four sovereigns, to No. 2, Sir John Stuart Forbes, Bart., of Fettercairn, county of Kincardine.

For the second best ditto—the premium of three sovereigns, to No. 5, Mr John Hunter, Beith, county of Ayr.

For the best three Pigs, under ten months old—the premium of three sovereigns, to No. 1, the Earl of Mansfield.

For the best Pig, not exceeding one year old, belonging to a Cottager paying no more than £6 of yearly rent, or whose cottage does not exceed that annual value—the premium of two sovereigns, to No. 1, Mr David Couper, farm-servant at Scro[illegible] [illegible]field, county of [illegible]

V. Poultry.

This is a species of stock the improvement of which has been long neglected at the exhibitions of this country, and why they should have been so neglected it would be difficult to state a single reason that would be satisfactory. It is to be hoped, therefore, that, in future, the improvement of every species of poultry reared on a farm will receive due attention. The classes of poultry which had been selected for the present exhibition consisted of turkeys and Dorking fowls. But the common fowl is capable of great improvement; and water birds should not be disregarded in our fondness for those of the land. There were entered for competition 3 couples of turkeys, 9 couples of mottled Dorking fowls, 2 couples of any other breed of fowls, and 3 couples in the extra stock; in all 34 birds. These premiums were awarded for this class of animals:—

For the best couple of Turkeys—the premium of two sovereigns, to No. 1, Lord Kinnaird, Rossie Priory, Perthshire.

For the second best ditto—the premium of one sovereign, to No. 2, Sir John Ogilvy, Bart., Baldovan House, Forfarshire.

For the best couple of Fowls of the mottled or speckled Dorking breed—the premium of one sovereign, to No. 3, Lord Kinnaird.

For the second best ditto—the premium of half a sovereign, to No. 2, Lord Kinnaird.

For the best couple of Fowls of any other breed—the premium of one sovereign, No. 1, Mr James Montgomery, Rankeillour, county of Fife.

For the second best ditto—the premium of half a sovereign, to No. 2, Mr Robert Walker, Portlethen Mains, county of Kincardine.

VI. Dairy Produce.

The dairy produce consisted of butter, and sweet and skimmed milk cheeses. There were 13 lots of butter entered in competition, 5 lots of sweet, and 9 lots of skimmed milk cheese; and 2 lots of extra butter, and 2 lots of extra cheese. The judges awarded the premiums thus:—

1. *Curing Butter.*

To the owner of any Dairy in Scotland who had made and cured, and exhibited at the show, the best quality of Butter for the market; the quality made and cured not being less than two cwt. during the season 1843—the premium of five sovereigns, to No. 11, Mr John Ramsay, Hilton of Balmuir, county of Forfar.

For the second best quality—the premium of three sovereigns, to No. 8, Miss Mary Grahame, Baldutho, county of Fife.

2. *Making Cheese.*

To the person in Scotland who produced the best specimen of Sweet or Full Milk Cheese, made of any variety that he shall find most profitable for the market, the quantity not being less than 1 cwt. of 112 lbs., 16 oz. to the lb.—the premium of five sovereigns, to No. 2, Mr Robert Arthur, Pirliehill, county of Stirling.

For the second best quality—the premium of three sovereigns, to No. 1, the Marquis of Breadalbane.

The judges recommended to the notice of the committee old cheese of particularly fine quality and flavour, exhibited by Mrs Dudgeon, Falkland Wood, county of Fife.

To the owner of any dairy in Scotland who had made for sale the best quality of

Cheese from Skimmed Milk, not being less than 1 cwt. during the season 1843—the premium of three sovereigns, to No. 2, Mr Robert Arthur, Pirliehill, county of Stirling.

For the second best quality of ditto—the premium of two sovereigns, to No. 7, Mr John Somerville, Lampitts, county of Lanark.

The judges noticed favourably specimens of Butter, and of Full and Skimmed Milk Cheese exhibited by Mr William Hamilton, Persland, Lanarkshire; and of Butter exhibited by Miss Grahame, Baldutho.

VI. Extra Stock.

There is usually a number of each class of stock exhibited as extra stock, because animals may individually possess sufficient merit to be shewn, which, at the same time, may be disqualified to compete for premiums on the conditions laid down by the Society. On the present occasion, there were exhibited of cattle 1 bull, 16 cows, 8 calves, 9 heifers, and 15 oxen—in all 45. The individuals amongst these which excite remark were 4 cows of the Dutch breed, imported from Holland by Lord Panmure, which had tolerably good frames, and were reputed good milkers, though very lean; and 4 pure north Devon heifers, belonging to Lord Lynedoch, a breed but rarely to be met with in any part of Scotland. Of horses there were 17, some of which were stallions. Amongst the horses was a very handsome ass, belonging to Mr Thomas Gowans, Addinbrae Mill, Mid-Lothian, of the Gazo breed, bred at Malta, and purchased there in 1842. His limbs were as straight as those of a horse, and his figure, breeding, and size, were far superior to those of any ass bred in this country. Of sheep there were 29, the most remarkable of which were 3 Southdown tups, belonging to Mr Jonas Webb, Babraham, Cambridgeshire; 2 tups, a cross between the Dorset and Wilts breeds, bred by Mr Watts, Scoldwell, Northamptonshire, and belonging to Mr James Anderson, Pitcarry, county of Kincardine; and 3 tups of the Saxony Merino breed, bred by, and belonging to, Mr Graham of Kincaldrum, Forfarshire. There were 5 pigs and 6 fowls. The judges commended the stock in this department belonging to the following exhibitors:—

The Duke of Richmond, four very superior Oxen, a cross between Short-Horns and West Highland.

Mr David Carsewell, Rathillet, county of Fife, three three-year-old Stots of the Fife breed, three two-year-old ditto, and two cows, in all eight, the produce at three births of the same cow, which was also exhibited.

The Earl of Mansfield, an Ox of the West Highland breed.

The Marquis of Breadalbane, two superior West Highland Cows.

Mr William Nicoll, Newton of Kirkbuddo, county of Forfar, a Cow and three calves of the Angus breed.

Lord Lynedoch, four North Devon Heifers.

Dr Fettes, Laurencekirk, a short-horn Calf.

Mr John Collier, Panlathie, five two-year-old blackfaced Wethers, considered good for their age.

Mr Jon[illegible] [illegible] county of Cambridge, three superior Southdown [illegible]s, dit[illegible]

Three Carriage Horses, belonging respectively to Lord Panmure, Mr Cossar, Dalkeith, and Mr James Gibson, Haughs of Cossans. Two very useful Fillies, exhibited by Mr Alexander Bowie, jun. West Scryne.

A fine Maltese Ass, shewn by Mr Thomas Gowans, Addinbrae Mill, in Mid-Lothian.

A fine white Pig, exhibited by Sir John Ogilvy, Bart.

Amongst the Poultry were noticed, as very superior, two Ducks exhibited by Lord Kinnaird.

VIII. Roots, Seeds, and Plants.

Amongst the various specimens exhibited, the collection of Messrs Lawson & Son of Edinburgh held a conspicuous place. It consisted of dried specimens and seeds of grasses; several varieties of wheat, barley, and rye, of crop 1843, from Tuscany and France; and a large specimen of *Trifolium elegans* of the French, and cultivated by them on inferior soils; also Schroeder's brome grass, (*Bromus Schroederi*,) a large rapid growing species, with soft, sweet, and succulent foliage, was for the first time recommended to be given as food for cattle; also a good specimen of meadow krome grass, (*Kromus pratensis*,) cultivated in France, for permanent pasture, on the poorest description of soils. Many others of Messrs Lawson's specimens were deserving of notice, and worth the attention of the botanist as well as the agriculturist.

The next collection of useful plants and roots was that of Messrs Dickson and Company of Edinburgh. The committee remarked twenty-four specimens of hybrid turnips as very interesting. Some of these hybrids in shape and size appeared very fine, particularly that of Skirving's purple-top yellow. Messrs Dickson also exhibited several specimens of grasses, Bokhara clover, and *Heracleum elegantium*; also some excellent specimens of Arthur's Alsike clover, a new variety, which, from its abundant herbage, promises to be a desirable plant for cultivation. Where it has been tried in Scotland it has thriven well, and ripened seed freely.

Some interesting specimens of the natural grasses, from Mr Bishop, land-steward, Methven Castle, Perthshire, attracted attention, particularly four distinct varieties of the *Alopecurus pratensis*, (meadow foxtail grass,) selected from the seeds of hay imported into Dundee from Holland in 1826. These specimens are illustrative of the improvements that may be made in the various species of cultivated grasses, by a judicious selection of seeds from natural plants. Mr Bishop had also a specimen of his succedaneum, to be sown in place of tares, and consisting of *Italian rye grass*, *Trifolium incarnatum*, a little *Timothy grass*, and *red clover*. The succedaneum should be sown in April, and makes an excellent substitute for tares.

There was also a notice of a sample of potatoes, raised from

seed by Mr George Sibbald, gardener, Crescent, Dundee, whi promises to be a good addition to the early garden varieti There was also a specimen of an early three-grained oat, habit similar to the naked oat exhibited by Mr John Stewa Carolina Port, Dundee. Mr William Henderson, gardener Delvin, exhibited a specimen of Egyptian wheat, raised fr seed taken out of the sarcophagus of a mummy in 1842.

There was also a specimen of early Siberian oats, crop 18 received from Messrs Scott, brothers, at Belfast, who introdu it in that district four years ago, and where it is now held high estimation, being by far the earliest sort known, while produce, both in straw and grain, is large in quantity, and quality first-rate.

One of the most extraordinary exhibitions in the yard that presented by Mr James Campbell, of the Dundee Pul Seminaries. It consisted of magnificent plants of oats and b ley, grown from seed which had undergone a certain chem preparation, and without the aid of any manure whatever.

Such a mode of culture is at variance with all practical ex rience; but Mr Campbell declares that his prepared seeds, wh have produced these strong healthy plants, were sown by him land which, to his certain knowledge, had had no manure of kind for eleven years; and he declared himself quite ready verify his statement by experiment, and said he was willi at any time, to impregnate with his chemical preparations, seed which any member of the Society should send to him that purpose, so as to enable gentlemen to satisfy themse fully as to the efficacy of this wonderful mode of culture. may observe that a German chemist announced a similar covery last year.

IX. Implements.

The judges on implements reported that the exhibition in department, though not so extensive as that of last year, creditable to the district, especially as regards the good wo manship of many of the articles shewn. There were sev ingenious and useful applications of mechanical skill to im nents previously known. The decision of the judges was ollows:—

The Ploughs exhibited by Lord Kinnaird were highly commended; and nedal was awarded to his Lordship for his Draining Implements.

Lord James Hay exhibited a strong Drain Tile, made of sand mixed with lings.

A premium of £1 was recommended to Mr Thomas Anderson, Kincardine his improved Bridle of a plough.

Same premium to Mr William Barron, smith, Ruthven, Forfarshire, for a su nough adapted to furrow draining.

A meda [illegible] for his Model of a Thras

eam Engine, on account of its simple movement, rendering toothed geer-sary.

ides exhibited by Messrs William Cadell and Sons, Cramond, were for their excellent construction.

im of £1 was recommended to Mr John Cameron, Bridge of Crathie, for ope Twisting Machine.

igh and Grubber of Mr Hugh Cowan, Corstorphine, was commended.

im of £3 to Mr Robert Dick, Scone, for his improved Cross-cut Saw.

im of £1 to Mr John Gilchrist, Forebank, Dundee, for his Sheep Nets, w Zealand Hemp.

im of £2 to Mr John Girdwood, Featherhall, Corstorphine, for his im-nip Drill.

im of £1 to Mr Thomas Inglis, West Linton, for a Plough, with shifting

mium to Mr George Lyall, Corstorphine, for his improved Turnip Drill.

al and a premium of £1 to Messrs R. and W. Russell, Denny, Loan-achine-made Cart Wheels.

ighs and Grubber of Mr James Kirkwood, Tranent, were commended; Drill Grubber of Mr Andrew Kyd, Flemington, and the Field Roller, ls, and Axle of Messrs Andrew Porteous and Sons, Fisherrow.

to Messrs Slight & Co., for their Iron Swingletrees; and the other Im-hibited by them were commended.

im of £2 to Mr James Weddell, Kettins, for a Grubber.

to Mr John West, Lundie, for Gravel Walk Implements; and other exhibited were commended for good workmanship.

Park Gate, and other articles in wire-work, exhibited by Messrs W. and Edinburgh, and Mr J. D. Young, Perth, were commended for cheap-sefulness.

im of £3 to Mr William Young, Monifieth, for the Mail-coach Patent d to carts, and for general good workmanship.

oved Corn Cart, exhibited by Messrs Rogerson & Co., Redgorton, was

g the implements exhibited, we were particularly struck nodel of that useful machine, the thrashing mill, and gine attached to it, exhibited by Mr Bridges of North . The simplicity of the whole structure and arrange-d withal the low price at which it can be furnished, mmend it to the attention of the agriculturist; and as ciple of connection and method of acquiring speed to the e exactly the same as employed, and so well tested, in our ves engines, there can be no doubt of its efficiency.

bserved, amongst the implements exhibited by Messrs light and Co., of Edinburgh, a machine which appeared much interest, but which had come too late for the ex-n of the judges. It is a working model of Ainslie's Drain-Tile Machine, which is in successful operation in ile-works, and which is capable of producing 40 tiles per or any length of time, each 16 inches long; and, from the f the process by which the tiles are framed, they are n form and texture. We have no doubt in our own minds tile machine will supersede all others at present known. eighing machines exhibited by Mr Craig, 163, Trongate,

Glasgow, attracted considerable notice. They are of foreign invention, on the parallel motion principle, are peculiarly delicate in their indications, and are mathematically correct. A very neat model of a machine, adapted to the double purpose of weighing carts or oxen, seemed to be very generally approved of. Its construction is calculated to stand the roughest usage without injury—the centres or pivots, the great source of inaccuracies of the common machines, being always at rest except in the actual operation of weighing. A hydraulic ram, also exhibited by Mr Craig, excited interest. It is a self-acting machine, so simply contrived that, by the alternate action of air and water, a continual stream is ejected 300 feet above the course of any convenient stream or rivulet. This machine is not liable to get disordered; and we should think it an excellent and cheap method of securing water, for house or engine purposes, in situations where the want of it is felt. The ram is certified by Mr H. J. Burns, who has had one erected at Cuttlehill, and given entire satisfaction; the water, in this instance, was brought 600 yards and raised 135 feet.

The garden chairs made by Mr William Dingwall, Bridge-end, Perth, were the most ingeniously constructed, and elegant in form, of anything of the same kind we ever saw.

On Thursday, all the stock that had obtained premiums, together with the implements, and seeds, and plants, were again exhibited in their respective stalls, from eleven A.M. to three P.M., in order to allow those who chose to examine the prize animals with leisure, and to afford an opportunity for the purchase and sale of stock. For the latter purpose a sale was conducted by the highly-experienced Mr Wetherell of Durham. On the present occasion, a good many lots were disposed of, but at moderate prices; and we did not hear of any of the first prize breeding animals having been sold at all. There was nothing, however, in the concomitant circumstances to damp the ardour of bidders, for the day was beautifully fine, the stock looked well, and were really good, the scene imposing, and the salesman more than usually eloquent. With regard to the tactics of owners of stock at such sales, we cannot help thinking it would be much better for the purchaser, because it would seem fairer, were they to put up their lots at the lowest price they will take, rather than reserve a bid for themselves. In the former case, everything would appear above board, but, in the latter, a bidder does not relish being outbid by the owner, because it looks unfair—like a trick; at all events it is felt as a disappointment; and many men, on being treated thus, are chary of bidding again.

In the creature comforts provided by Messrs Stewart of the

ish and Royal Hotels, we must express our opinion, that in
place has the Society been so well served, both as to the
ing of the viands, their quality, and the taste in which they
served up. The wines, too, were of a superior order to
t are usually presented on such occasions.

hough not connected with the Show, we cannot omit to men-
that the Watt Institution of Dundee opened an exhibition
aintings, models, and a variety of miscellaneous articles.
Society sent the greater part of the more movable of their
els of agricultural implements, together with specimens of
ous woods from foreign countries. The hall of this institu-
being situated on the way to and from the show-yard, many
ons paid a visit to this exhibition; so many, that, we under-
l, on the show-day, Wednesday, about £70 were drawn,
ne shilling each person. Another source of attraction
ed to the public by the directors of this institution, and
farther means of assistng its funds, was the delivery of lec-
s in Bell Street Chapel, beside the hall, by Professor John-
of Durham, and Mr Smith, late of Deanston. Two lec-
s were delivered by Professor Johnston on the application
hemistry to the culture of the soil, and to the feeding of
k; and one by Mr Smith on thorough draining. The time for
ering the Professor's first lecture was properly chosen in the
noon of the Tuesday, at three o'clock, after the adjourn-
of the general committee, and the arrival of most of the
ngers in town; but, in our opinion, the attempt to deliver
second lecture on the show-day was injudicious, and especi-
at an hour (three in the afternoon) before people usually
the show-ground, and when all who attend there are fatigued
the labours of the day. With the sole view of preventing
ppointment to the directors, as well as to the learned Pro-
r himself, by a thin audience, we took the liberty to write
he directors, when apprised, by advertisement, of the time
for the second lecture, to persuade them to postpone it to
orenoon of the succeeding day, Thursday, when people would
leisure to attend it at ten o'clock in the forenoon, on their
to see the prize animals exhibited in the show-ground, and to
nd the sale of stock at eleven, but the hint was disregarded,
the consequence was that the Professor had to propound an
esting subject to a small audience, as we understand, for we
no leisure, from other avocations, to attend any of the lec-
s. Rather than have chosen the show-day for the second
ure, it would have been better had Mr Smith relinquished
lecture on the Thursday, as the advantages of thorough
ning are now so well understood by Scottish farmers, that
cannot be tempted, *in the circumstances*, to listen to any lec-
on so familiar a subject.

MISCELLANEOUS NOTICES.

1. *The Drainage of Land combined with the Sewerage of Towns.*—Let us return to the all-important subject of employing the poor in the work of drainage; for every week is adding to the inmates of the Unions.

Draining, whether considered as a means of profit, or as a national benefit, is of the highest interest and of the most urgent necessity. It is in actual evidence that by the mere removal of stagnant water, without further outlay, land which had grown two or two and a-half quarters of wheat per acre, has at once produced three and a-half and four quarters. This well-ascertained fact renders all reasoning as to causes superfluous in a practical point of view. The necessity of doing something is, in fact, admitted; the difficulty consists in setting about it. It is plain that if any one takes to drainage independent of his neighbours, the acts of one man, or his inaction, may render other proceedings ineffectual. What we trust will be done, is the passing of some General Drainage Act, which shall give consistency and union to one general operation all through the country. Upon this point Mr Bailey Denton's views appear to us extremely well worth the consideration of Government, which we most earnestly hope will take the initiative in the ensuing session of Parliament.

Let us, however, not be misunderstood: we do not desire a measure which shall compel everybody to drain their fields and gardens, whether they choose to do so or not; all that we wish for—all, indeed, that it would be prudent to propose—is some general enactment, which shall facilitate the effectual drainage of such lands as the owners may desire so to improve. Any proposition to compel drainage would, of course, be met by a direct negative from the landed interest; but we know, from experience, that, so long as the operation is *wholly* dependant on individual exertions, there will be no such progress made in it as the nation will feel. Look, for instance, at Mr Pusey's Act of 1840, which enables the owners of settled estates to borrow money by way of mortgage to drain their lands. Do any of our readers know a single case in which this valuable measure has been taken advantage of? We know of none; and from this fact we are compelled to infer that there is wanting some legislative measure which shall induce, not compel, the gradual and complete drainage of our heavy lands. Among the suggestions that have been offered with a view to secure a general system of drainage without encroaching on private rights, that of Mr Denton seems the most practicable. This gentleman recommends that means should be immediately taken to provide ready and complete outlets for all the waters which now stagnate *on the surface* during floods and in wet seasons; and he is of opinion that, if this were once effected, under-draining of neighbouring lands would certainly follow; for the effect produced by the one would render obvious the advantage and ease of accomplishing the other.

To do this with the greatest benefit to the country, it would be necessary to clear and improve all the more important of the watercourses which now intersect those valleys where, in consequence of some barrier, or the insufficiency of size in the channel of such streams, the accumulating waters overflow, and, becoming stagnant, sour the adjoining pastures, and destroy the autumn-sown corn. In those valleys where there are no natural watercourses, and where the waters collect on the surface, producing even worse effects, open public drains would have to be made, connecting such valleys with some natural stream. All these watercourses would become so many public mains, and would form over all the country a general net-work of ready-formed outlets for the use of the cultivators of the lands through which they pass, at any time when the price of labour and pecuniary means may induce them to undertake such work. This would be a prodigious advantage, and might be economically obtained. There would then be no cases in which a want of outfall, or the ill-feeling of a neighbour, would stand in the way of draining. It could not happen that one person's land would be deluged by the refuse waters of his neighbours. An enterprising, sensible market-gardener could not then be inundated by the unwillingness of a man on a different land, who refuses to join in a work of drainage. But in this undulating country such instances must continually occur, if nature, unassisted by art, is to guide descending waters to their natural outlet. Our readers have only to turn to Mr Chadwick's Sanatary Report, p. 305, (where he relates a case that may be taken as the type of many,) to find evidence of these evils. They are, however, so common, that few will read these remarks without feeling their application to some [illegible] personally acquainted.

ies like these would cease if the principle that every landowner, large and uld have outfall for injurious water were made the basis of an Act of t. The amount of compulsion involved in such a measure would be merely ized entry of scientific officers to direct, and of labourers to construct, the ns which, with few exceptions, would be confined to the valleys; those being along the junction of the out-cropping of particular strata. For n districts where the clay overlies the chalk, a drain along the junction rcept the water running off the clay, which water would otherwise drop the chalk until it reached the subterranean level of the water in that for- nd, *vice versâ*, where the alluvium of the valleys outcrops along the hill- porous strata, the springs which exude at the junction would be caught ring drain for *after application.*

sent state of the country bears ample testimony to the necessity of a pre- public measure for the improvement and preservation of outfalls and ses upon the three fundamental principles of drainage laid down by Sir nie, in his vindication of the plans of his father, of Smeaton, Telford, Milne, s in the Middle Level drainage, viz., "The improvements of the outfalls nels of rivers; the judicious construction of inferior drains for low-land and catch-water drains for high-land waters." When this great engineer e expressions, he was alluding, indeed, to the great work of fen-drainage, requiring great engineering talent to carry out effectually, has ever been d as a distinct matter from the drainage of heavy uplands; but we think nt season, and indeed all previous winters, must have convinced the most that there exists some analogy with the two works; and that, with all the ining in the world, the valley lands will not become so profitable as they le of becoming, *so long as the waters of the higher lands may stagnate on the ls.*

orst pastures are the lowest lands;* and since all evidence goes to prove e is not an acre of land in this country which has not, or may not, command utfall for its superfluous water, and which consequently is not susceptible gh draining, a fresh field for the employment of the poor opens itself to the griculturists.

suppose that, by a general measure for the improvement of outfalls, the and tenants became united in an earnest wish to make the most of an ad- which would then be readily attainable, and that they set about under-drain- od earnest, the immediate effect would be, to convert into arable land all inferior pastures which are now overflowed; the tillage of these would arge instant demand for labour, and a wide extent of land peculiarly fitted owth of wheat would be gained to the nation. These are points in them- no small magnitude. In addition, we may with certainty anticipate that, case of parish and turnpike roads, employment for some few surplus hands so would the parish drains, if under skilful management, create a like de-

nnot but think that, with such security and assistance as the measure we cate would afford, the landed interest would be aroused into action; com- uld be formed to find capital, and to superintend great works of under- and the unions would be relieved of the present excess of inmates, while o the country would be repaid by the profits on the uses to which the waters ined might be applied, *if made the vehicle of carriage for the refuse of towns, ion, and as a moving power;* thus turning a present evil into a future benefit. already stated that, during the last session of Parliament, Mr Pusey gave a committee to inquire into the subject of Drainage; and we believe that was prepared to establish and shew the necessity of enforcing the univer- nce and maintenance of the outfalls now existing, so that underdraining reafter become a less difficult and costly operation. We are, however, not t there was an intention of making the measure universally compulsory, ng it under scientific administration; nor do we understand that the after- n of draip-water had attracted the attention of those agricultural Members ment who are generally interested in such matters. Indeed, it is chiefly amphlet of Mr Bailey Denton,† already referred to, that the subject has

* Alluding, of course, to the clay lands.

† General Drainage and the Distribution of Water. Ridgway, London.

been examined: and as we agree with that gentleman in believing that even more ultimate profit may be derived to the country from beneficial after-uses of drain-water than from the mere eradication of existing evils, we shall now proceed to consider that topic.

If a profitable distribution of the drain-water, which now is so injurious from its stagnation, be practicable, it must be secured by uniformity in arranging the receiving watercourses; and although that uniformity can only be worked out in districts, still it is essential that those districts should be allotted in relation to the whole country, and without regard to the interests of private individuals. This systematising of the mains or receivers is the amount of compulsion to which we alluded in our former notice of the subject; and we are of opinion that, in the absence of such compulsion, the nation will never be made to feel a great and important change, but will be brought, by the desultory plans of separate individuals, into the same condition as London, so far as regards systematic arrangement of the mains, and the application of the valuable matter to be derived from them.

The dislocation of the metropolitan sewers is a matter of common complaint; they have been planned without reference to each other, and now they will not work together; but had all the London works of this kind been formed upon one well-considered, preconcerted plan, not only would the drainage of London and its suburbs have been more effectual, but the water of the Thames would still be as pure as it was originally; and instead of being corrupted by the refuse of the town, the valuable contents of the sewers might have been directed to the large increase of agricultural wealth. By some such uniformity of arrangements as would have secured to London advantages of which we can now only regret the loss, the waters of the higher lands may, in many cases, conduce to the fertility of the lower lands. But this uniformity can never be secured if we allow the opportunity to pass without incorporating with the regulations of a General Drainage Act stringent provisions for regulating the dispersion of the water to be gained by its operation. There is no apparent reason why the measure which renders clay lands dry enough for improved cultivation should also not make light lands moist in all cases where a transfer of surplus water can be effected advantageously; though such opportunities would not be general, they certainly would occur.

England cannot indeed be called, in strict agricultural terms, an irrigating country; but, nevertheless, cases may be found in Wiltshire, Bedfordshire, and many parts of Scotland, where the benefit to be derived from such a use of water is distinctly shewn. By combining the measure we are now advocating with that for the sewerage of towns, land-waters would be exchanged, where localities are favourable, for urban refuse. Where towns are situated in valleys, on the one hand, the waters from the hills above would we collected, (as at Greenock,) and conveyed into the towns for cleansing the streets, flushing the sewers, and furnishing a supply for domestic purposes; and, on the other, the refuse substances would be conveyed to the land, either in mixture with the water that had served for cleansing the town, or, after being raised into flat-bottomed vessels, like the boats used by the Germans for the same purpose, it would be floated along the connecting watercourses into the country for use as solid manure. Near Edinburgh, in the Craigintinny meadows, we have a well-known proof of the value of irrigating with the contents of sewers; for there, sandy inferior land has become worth £57 an acre, annual rent; not that we are at all disposed to advocate the manner in which the sewerage is used in this instance. On the contrary, we agree with Mr Bailey Denton in regarding such a selfish use of the sewerage in the light of an abuse. We would rather turn to Mr Roe's very recent Report on the Drainage of Eton; because the improvements suggested by him afford a better illustration of this part of the subject. That gentleman (whose great practical experience entitles his observations to the most careful consideration) particularly directs attention to the importance of the contents of sewers for irrigating meadow land, and turning them to profitable account as a means of supplying an abundance of rich manure. We have already seen, in the Report of the Poor-law Commissioners, that the contents of the ditches at Eton have been found to kill the grass; a circumstance which plainly shews the ignorance of some farmers, and the value of sewerage when sufficiently diluted and judiciously applied.

With regard to the application of drain-water as a moving power, there can be no doubt that this may be effected in many places at a cost quite trifling when compared [illegible] must be at this moment numberless springs, gushing from hill

ides, having a flow of water sufficient to drive a 10, 20, or 30 feet wheel, and therefore capable of being instantly turned to profitable account. Upon this point we would particularly refer to Mr Bailey Denton's pamphlet. If the supply from springs were augmented by water brought together by main-drains, we should confidently look for this branch of its application being carried to a great extent. Indeed it is only necessary to turn to the instance afforded by Lord Hatherton, at Teddesley, and to the mines and works in Wales, in Cornwall, Devon, and Ireland, to gain assurance of its paramount economy. Besides, as we cursorily remarked before, the quantity of water to be accumulated by judicious management would afford means for compensating mill-owners and others, who may be aggrieved by the removal of their mills, weirs, and dams.

We think every one will agree with Mr Denton, that, if the *after-application* of drainage-water should form part of any legislative measure, not only would the direction of the system be more skilful in itself, but the obligation on the part of individuals to keep their watercourses clear would produce a result more beneficial to thorough drainage than could arise from any measure devoted to that object alone.

In recommending to Parliament the propriety of uniting the distribution of drain-water, and of the refuse of towns with the improvements of outfalls and watercourses, we do not advocate the execution of expensive works, like the aqueducts and reservoirs of Lombardy, Spain, and India; these, in a country like England, would not repay their cost. All we ask for is, such as may be constructed economically and profitably, and which, in their maintenance and repair, would create a continued and paying demand for labour in winter.

But it may be asked whence all this water is to come? Upon this point we shall content ourselves with referring to Mr Denton's pamphlet, where it is shewn, by fair calculation, that the force of surface water alone is equal to 2,000,000 horse-power, the whole of which might, by skilful engineers, be turned to the useful purposes we have mentioned.*

These considerations must, we think, be felt by every one to be of great importance to the country; they demonstrate how enormous are the annual losses of national wealth by neglect, supineness, or unskilfulness; they point out a new and immense field for the employment of labour profitably; and we do trust that they will lead Parliament to give the whole question the most careful consideration without further loss of time.—*Professor Lindley in the Gardener's Chronicle for January*, 1843.

2. *Letter-File and Register.* By Mr W. W. Fyfe, Berwick-upon-Tweed.—Letters received, although to every one of equal, to many of essentially greater importance, than those dispatched in the course of business, have never been put upon an equal footing with the latter, inasmuch as the methods employed to preserve and sort received letters are usually defective, cumbrous, and attended (in large concerns) with clerical labour, and a disfiguring of the documents—sufficient, in many instances, to preclude their being docqueted and arranged at all. Indeed, it is well known that many merchants and men of business—unable to overtake the "labour of the *file*," in this toilsome sense, or averse to submit the substance of their correspondence to others, even confidential clerks, for the purpose of undergoing the process of arrangement—prefer the dangerous alternative of allowing "received letters" to accumulate into a mass of inextricable confusion. It is unnecessary to enlarge on the consequences of such a state of things. Should a letter be wanted, it is, for the time being, nowhere to be found! The owner of a letter is thus insecure of possessing it. He may hug himself on the certainty of his doing so; but when the document comes into immediate request, the fancied certainty resolves itself into a mere chance of discovery! And how does he know but that portions of his letter-hoard may have escaped the precincts of its place of depositation, revealing the treasured secrets of his calling, of his pursuits, or affairs, to the accidental finder, whoever that may be?

It is true that, by a due process of docqueting, labelling, and stowing away into pigeon-holes, tin boxes, and other receptacles, something like regularity is occasionally attained. But we have already adverted to the labour involved in this. And we believe the inconvenience of the system still more effectually defeats the end for which it is designed.

* The suggestions which gave rise to the above remarks are more minutely explained in an Article on "*Drainage*," in the Westminster Review for February, 1843.—Editor.

The remedy now proposed may appear almost too simple to require suggestion. Its simplicity can, at all events, be no bar to its utility. And we shall deem ourselves rewarded if we succeed in promoting the comfort of only a few individuals who, like ourselves, may find much of the time and attention demanded by weighty avocations consumed in arrangements which, however finical, have hitherto been found essential to obviate confusion, or in painful or fruitless searches after stray papers, consequent on the want of proper systematic arrangement.

All we propose is to do for letters received what is done for "letters despatched." And this we accomplish much in the same form, at little cost, with comparatively little labour, and (from the greater command over the arrangement) in a more natural order for reference and indexing.

The letter file and register takes the form of the empty boards of a book, of which the upper or left hand board *ad aperturam* is movable upon a sliding hinge of a simple construction, so as not only to admit of its opening outwards like any other volume, and like its counterpart, the corresponding board—but so also as it may slide down upon the latter, or remain up from it, at any height requisite to accommodate the "letters received," as they are progressively filed betwixt the two boards, until the volume is filled up.

The whole contrivance, then, is very simple. THE BOARDS may be made of ordinary bookbinding materials; or, if made of tin, may embrace the principle of the tin safe in its most approved forms. They are formed exactly like the empty boards of a book—the left or upper one being detached, leaving the bulged back and right or lower board connected in the usual way in binding. If tin were used, the hinge connecting the right or lower board with the bulged back might be a serrated one, close fitted, and moving on a wire.

The construction of the other hinge admits of the sliding board being turned over free of the points of the files by which it is perforated,—leaving space for the operation of filing on letters. And when letters are placed upon the points of the files, this board being turned over above them, will press them securely down to their destination on the file.

THE FILES are fixed on the under board, and perforate the movable or upper one. Their lengths being adjusted so as to admit of the sliding board passing clear of their points when slid up to the width of the volume, and turned back on its hinge. The points of the files are bent backwards to facilitate the turning over of the sliding board, and to prevent the files running into the fingers. In filing letters, cards, notes, &c., respect can be had to the thickness of the volume, by full-length letters being passed down on the *whole files*—smaller ones, notes, &c. on one or *more* of them, at convenience. The number of letters on hand being passed over the points merely of the files, the upper board, as already mentioned, is to be passed over the points also, and slid down on the filed letters. The elasticity of any quantity of filed letters may be subdued by loading the sliding board sufficiently; or by the use of a screw or spring-clasp if preferred.

THE INDEX—a matter of the last importance—is attached to the inside of the sliding board, fastening up with a catch, just clear of the prongs or files, and jointed to the front of the board inside. It is the usual alphabetical index. The first letter filed will be numbered highest, (1000, if the file is calculated for that amount,) and entered so as to be found at such a number in the Index—either the name of the writer or the subject of the communication being taken for the head under which the entry is made. The next letter, of course, will be numbered one less, (say 999, if the book is calculated for 1000,) and so retrogressively back to No. 1, which will be the latest letter received, and the first met with in reading the file. When the book is filled, the three rounded points of the file just rest within the slits through which they perforate the sliding board; and if the sliding board has been properly kept under pressure during the filing of the contents, the whole will be nearly as firm as the contents of a bound book.

When made of tin, flaps might be hinged round the edges of the lower board, so as to form a complete tin box or safe.

In this way not a letter need be received, even on private matters, which could not be found in an instant; and corresponding volumes of "letters received" would stand side by side in the counting-house with the "letter books" of written dispatches.

ɔan, of course, be made to any size. The quarto for common use: for the r Merchants' offices, it is probable the folio size might be preferred. The should be limited to contain about 500, larger sizes may swell out to 1000: ɔe obvious that the filing of letters in the manner proposed is an im- on every method usually adopted, and if attended to with regularity, ıtegrate these documents into one complete record, entitled to bear faith t of law as a BOOK OF BUSINESS.

of arrangement could be less cumbrous than this book, where, in effect, are bound up in a uniform series.

whole routine of filing, although more complete and compact in its results, ss troublesome in operation than any other that could be named—requir- l the mere enumeration of the documents and entry in the Index, no cle- · whatever, and being consequently attended with not the slightest disfi- the letters, but admitting of their being preserved, we may say to the end attended by that venerable but somewhat odious commodity, "the dust

ay *Taxation—Railway Mails.*—A return to an order of the House of ɔn the subject of railway taxation has just been printed, and contains us details. The return embraces a period of ten years, ending the 5th of st. The total amount of tax paid on English railways in 1832 was only ıely, L.18 by the Leicester and Swannington Company, and L.621 by the and Manchester; whereas, during last year, one company alone, (the d Birmingham) paid L.25,940; another, (the Great Western,) L.25,804; he Grand Junction,) L.13,545; and a fourth, (the South Western,) being upwards of L.77,000, from four of the principal companies. In Liverpool and Manchester tax had risen to L.5,646, and in the following L,259, between which amount and L.8,105 it has since fluctuated. In 1837, › Greenwich Railway paying L.858, and the Grand Junction and London ıgham, then appearing for the first time, the former at L.5,005, and the ʟ.1282. They have since been as high as the Grand Junction, (1840,) and London and Birmingham, (1841,) L.26,227. Without dwelling upon ediate years, the following figures, taken from the returns, will shew very w serious a diminution must have taken place in the receipts of some of companies during the last year, when the falling off in the amount of duty › considerable:—

	1840.	1841.	1842.
m and Derby	L.2,720	L.2,337	L.2,136
m and Gloucester	720	3,645	3,262
ıction	15,030	14,456	13,545
ınd Manchester	8,105	7,909	6,798
d Birmingham	24,806	26,227	25,940
ounties	2,862	5,289	4,834
r and Leeds	3,032	8,023	7,804
land	3,697	7,869	6,182

t of the minor companies have suffered in a similar way. Thus:—

	1840.	1841.	1842.
d Greenwich	L.2,696	L.2,679	L.2,504
d Croydon	1,636	1,743	1,582
d Wyre	418	934	489
ıd Rotherham	—	277	260

t, the change in the mode of levying the duty from one-eighth of a penny ger, per mile, to five per cent. upon the gross receipts, tended to diminish ıte amount of tax received from the low-priced lines, but as the alteration ffect from October last, the decrease from this cause, in the year ending annot have been very considerable. The diminution in the amount of tax o be ascribed to the same source as the diminished dividends of which the at their late meetings complained, namely, the commercial distress of the ring the past year.

lines on which there was an increase in the amount of duty paid during

last year are these. As regards the Great Western and South Western, this may be attributed to the further distance opened :—

	1840.	1841.	1842.
Eastern Counties	L.1,317	L.1,750	L.1,875
Great Western	10,966	21,814	25,[illegible]
London and Blackwall	1,031	2,367	2,[illegible]
London and South Western	10,131	10,6[illegible]	12,043
Newcastle and Carlisle	839	1,486	1,[illegible]
York and North Midland	1,367	2,722	[illegible]

The returns for Scotland shew a similar falling off in the last year. Thus :—

	1840.	1841.	1842.
Edinburgh and Dalkeith	L.613	L.[illegible]	L.611
Garnkirk and Glasgow	444	[illegible]	[illegible]
Glasgow and Ayr	1,777	3,880	2,[illegible]

The only increase is in the	1840.	1841.	1842.
Glasgow and Greenock	L.404	L.2,926	L.3,419

The Edinburgh and Glasgow line was not opened till last year, but already it has paid more for the time than any other Scotch railway, namely, L.4,941.

The returns, as regards Scotland, shew forcibly the difference between the amounts which used to be paid in the way of "compounding" for the tax, and those charged in the usual way. Thus, the Edinburgh and Dalkeith line, which for four years, ending in January, 1839, had compounded for L.200 or L.250, paid in 1839, when the "compounding" was abolished, L.786, and the Dundee and Arbroath from L.50, in 1839, was in 1840 raised to L.878. The recent alteration will again bring the tax to something like a fair proportion of the total amount received, and, no doubt, this will be very apparent in the next returns of a similar kind that may be called for.

Other returns, with reference to the conveyance of mails by railways, were also issued at the same time ; but the details are not so interesting as might have been expected. Almost the only point worthy of note is the rate per mile paid to the several companies, and here there appears a most unaccountable diversity. Thus we find that, per single mile, the

		s.	d.	
Birmingham and Derby	get	3	6	10-16ths.
Birmingham and Gloucester		2	$7\frac{1}{4}$	
Chester and Crewes		1	$8\frac{1}{2}$	
Grand Junction		1	4	7-8ths.
London and Birmingham		1	$9\frac{1}{4}$	
Midland Counties		1	$5\frac{1}{4}$	
North Union		2	$8\frac{3}{4}$	
Preston and Lancaster		3	$2\frac{3}{4}$	
York and North Midland		2	$10\frac{1}{2}$	

The largest amount paid per annum to any of the companies for the conveyance of the mails appears to be to the Grand Junction—namely, L.17,490. The London and Birmingham receive L.14,510, the Birmingham and Gloucester L.10,156, the North Union, and Lancaster and Preston, L.4,443 and L.4,745 respectively, and the Chester and Crewe, Midland Counties, and North Midland, about L.2,000 each. The Greenwich receives L.50 per annum, and the Blackwall, (used on Tuesday and Friday mornings for the Dutch mail, and occasionally for the home mail,) 5s. per trip. A return shewing the number of mail-bags lost, or detained through the carelessness of the servants of the railway companies intrusted with the charge of them," has "nil" in reference to bags "lost ;" but as respects "detentions," the Grand Junction, as usual, comes first in mismanagement. Thus, Grand Junction 11 ; South Western 6 ; Great Western 5 ; Birmingham and Gloucester 2 ; and North Midland and Liverpool and Manchester 1. These are the whole of the returns, and it is therefore to be presumed that, on the London and Birmingham, Birmingham and Derby, Midland Counties, and other lines not named, no detention has occurred. This is greatly to [illegible]

September, 1843.

NG July, the rain increased so greatly, from casual showers essive days, and the temperature continued so low, that ensions regarding the safety of the crops, and the probaf the lateness to which the harvest would be protracted, to be alarmingly felt. August, however, made its appearmidst milder temperature, whereby the rains gradually d. We can say with satisfaction that, since the 8th of onth until now, beyond the middle of September, the r has been as clear, as warm, and as delightful as the most ous invalid could desire. The thermometer has ranged 65° to 75° in the day, whilst it did not descend below 56° night; and the range of the barometer has not exceeded 1 inch above or below 30 inches. The happy consequence improved state of the weather is the hardening and ripen- all sorts of grain in an extraordinarily rapid degree, ese were the only results desired, as the grain had had nt time and moisture to be enlarged to its full size. In anner the leaves of the green crops have been invigorated panded to a degree of high health.

r the wheat had fairly grown up after spring, it was, in nstances, observed to be thin on the ground. Upon the however, it is a fair crop as to bulk, and there being a breadth sown this year than usual, there need be no ension of a deficiency of food for the wants of the people, lly as we may now reckon on a short year to the ripening next crop. The quality cannot be so fine as the wheat of ar, though we have no doubt that some fine samples will sented to market. The breadth of barley is rather less sual, and on heavy clays and poor gravels the crop is thin, lly where late sown; but the general crop is thick on ound, though the sample will not weigh so heavy or be ght as that of last year. There seems to be a greater h of oats sown in this than in a few past years. On dry soils the crop is an excellent one, though on heavy wet is thin; but upon the whole there is a fair crop. Where d is in good heart, the dropping season has caused both and pease to run to straw, and the yield, of course, will in proportion; but on fine soils, suitable for beans, they odded well, and this fine weather will give them a favourance of becoming ripe in proper time.

arding the country generally, the hay is deficient in quanhough its quality is good and its price not too high, 7d. l. per stone of 22 lb. Pastures improved very much after in began to fall in June, and there was room for improvefor wherever it had been early eaten, it was literally bare.

Since the appearance of the white clover in July, there a good bite for stock, but still there has not been time to their condition. This weather, however, will make tl math nourishing.

We mentioned, in our last report, that very genera had been experienced amongst the potatoes. Since then, that the rain had brought to life many sets that were t mant—that the failure is more general and severe on coast than on the west—and that, in the Highland glen happy to learn the crop will be abundant. We thre speculative hint that the failures might be accounted fo degenerate state of the plant, superinduced by too long tion from the tubers alone—that, being in a weak state, is now easily affected by the vicissitudes of seasons, and d of culture and soils—and, consequently, that the great last year had probably rendered the tuber too farina starchy to retain its vital power in full vigour. We hε been told, by more than one friend, that we are quite our conjecture, because potatoes raised in the same field have grown well in one situation and failed in another, tl and the conclusion drawn from this fact is, that it is t of treatment of the crop that is the sole cause of the failı doubt none of the facts of this kind which may be addu one reply will answer them all, that they affect but s causes and leave the principal cause unnoticed ; for whε cause by which different results are obtained on using t the same crop? We observe that the mind of the farmeı up with the ultimate effect produced by secondary caus it should rather investigate the primary source of the e doubt he is most interested in the ultimate result of hi crop, and this naturally attracts most of his attention ; his interest will not be secured until he discovers the the evil which affects that crop. We are glad to our conjecture receives considerable support from an ob in the number of Professor Johnston's Lectures on Agı Chemistry, just published, (for September, 1843.) In to the value of the common opinion that the less ripene of the upland districts makes the best seed, he says "Thi part be a true explanation of the fact, if, as is said, t potatoes always contain the largest proportion of starc some very interesting observations of Mr Stirrat of vould seem to indicate that *whatever increases the per c starch increases also the risk of failure in potatoes that used for seed;*" and although the Professor doubts that thi alone in the constitution of the potato can explain th yet he considers that, "with the increase of the star *probable* that both the albumen and the saline matte

vill in some degree *diminish*, and *both of these* are neces-
its fruitfulness when used for seed." Although this view
receiving support, yet, as the subject of the failure is
ss involved in great perplexity, we agree with the Profes-
; it "is highly deserving of further investigation." The
d weather has very much improved the state of the turnip
id where they were early sown on dry soil they will prove
ough, on the whole, they are under the mark.
cattle and horses have met with dull sales, and, conse-
, their prices are lower than last year. The graziers
t been remunerated by their stock, though we think that
umn grazing will pay them better than that of the early
the season. Dairy cows have also fallen in price. Sheep
ibs are from 6d. to 2s. 6d. per head lower than last year,
nay partly be accounted for from the generally deficient
the turnip crop, and, perhaps, more from their own con-
ot being so good as it was last year. Though prices did
high yet we observe that sheep sold briskly at the Sep-
Falkirk Tryst, most of the lots being taken off by two
in the afternoon. The fair muir was by no means full,
was understood that most of the prime lots had been
ip on their way to the market, which is of itself a cheer-
n of an increasing demand from the south.
rt says of the crop in the north of Europe, that wheat
ve deficient both in quantity and quality, and the defi-
n quantity alone, compared with last year, may be stated at
quarter. Barley and oats are a fair crop, but not equal
of last year. Rye good in quality, but deficient in yield.
nd beans both deficient in quantity, though the quality
ove fair.
own grain markets have been remarkably steady during
rter. On account of the alarming state of the weather
, large orders were given for foreign grain, which has
nd is still importing in considerable quantities. It is
l that the speculation will pay, for although our own
in cannot compete in quality with the old which is being
d, still prices abroad are not low, say 36s. per quarter,
to this be added the freight and duty which is not
d to drop below 14s. per quarter, these will raise the
o 55s. per quarter, while our own wheat will not likely
ove that price. The profit of the speculation will there-
confined to the intrinsic value of the imported over that
own wheat, If this is a fair judgment of the matter,
little prospect of any importation of the inferior quality
new crop.
est work goes on apace, and as the weather for ripening
ly favourable for the high as the low country, there is

such a demand for shearers as to raise their wages higher than they have been for some years past. Much of the barley and some of the wheat have been already led in apparently fine order; but farmers would require caution in leading corn quickly in hot sunny weather, as it is very apt to *come again* in the stack. It is said that the yield of wheat in England is less than was expected, and the consequence has been to check the transfer of foreign wheat from bond into the market, as, in case of the deficiency proving correct to a serious extent, the duty may be expected to fall.

Orchard and wall fruit are nearly a complete failure this season. The small fruit, such as strawberries and gooseberries were plentiful, but neither had their natural flavour.

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th July, 1842, and 5th of July, 1843—shewing the Increase and Decrease on each head thereof.

	Quarters ending July 5. 1842.	Quarters ending July 5. 1843.	Increase.	Decrease.	Years ending July 5. 1842.	Years ending July 5. 1843.	Increase.	Decrease.
	L.	L.	L.	L.	L.	L.	L.	L.
Customs, ...	4,422,191	4,557,206	135,015	. .	19,449,735	18,934,809	. .	514,926
Excise, ...	2,900,100	3,040,113	140,013	. .	12,530,397	11,515,520	. .	1,013,859
Stamps, ...	1,677,379	1,638,010	. .	39,369	6,649,087	6,445,370	. .	203,717
Taxes, ...	2,059,239	1,984,831	. .	74,408	4,440,162	4,191,120	. .	249,042
Post-Office, . .	154,000	145,000	. .	9,000	539,000	598,000	59,000	. .
Miscellaneous, .	243,757	1,096,024	852,267	. .	747,327	1,767,541	1,020,214	. .
Property Tax, .		871,609	871,609	. .	. .	3,317,997	3,317,997	. .
			1,998,904	122,777			4,397,211	1,981,544
	Deduct Decrease.		122,777		Deduct Decrease.		1,981,544	
	Increase on the Qr.		1,876,127		Increase on the Year.		2,415,667	

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date. 1843.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
June.	Danzig.	31/ to 40/6	19/4 to 21/6	11/6 to 13/	25/ to 27/	23/ to 25/	21/ 22/6
July.	..	36/6 41/	20/ 23/	12/ 15/	24/6 26/6	21/ 24/6	22/ 24/
Aug.	..	38/ 46/	22/6 25/	13/ 15/6	23/ 25/	22/6 25/	21/6 22/
June.	Hamburg.	30/3 37/	19/6 22/	12/ 13/	21/ 26/	18/6 24/	18/ 20/
July.	..	33/ 41/6	21/6 23/3	13/ 15/	25/ 27/	20/ 21/6	18/6 21/
Aug.	..	40/9 48/6	24/6 25/	14/ 15/6	23/ 21/6	20/ 24/6	20/ 24/6
June.	Bremen.	29/6 36/	18/ 21/	14/ 15/	23/6 25/	22/ 24/	20/ 24/6
July.	..	36/ 39/	20/ 21/6	15/ 17/	24/ 32/	23/ 26/	22/ 27/
Aug.	..	40/6 46/	19/6 22/	16/ 18/	25/ 27/6	21/ 23/6	22/ 25/
June.	Konigsburg.	31/ 37/6	18/ 20/6	13/6 14/6	24/ 26/6	18/6 20/	18/ 20/
July.	..	36/ 42/	19/6 23/	13/ 16/6	22/ 25/	22/ 23/6	19/6 21/
Aug.	..	40/ 48/	20/ 25/	17/ 19/	21/6 24/	18/ 20/6	17/6 19/

The Freights for June averaged from 2/2 to 3/2 per quarter in full; for July, from 3/6 to 4/6; and for August, from 4/2 to 5/6.

TABLE OF PRICES, &c.

s of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

r.	Oats.		Rye.		Pease.		Beans.	
.	s.	d.	s.	d.	s.	d.	s.	d.
2	18	3	30	6	29	6	28	5
5	18	7	30	2	29	10	29	6
8	19	1	30	9	30	4	28	11
5	19	0	31	4	30	10	30	2
1	19	8	31	10	31	9	28	6
1	19	1	32	6	32	4	30	7
1	19	7	32	10	33	8	30	3
6	20	1	34	6	33	9	31	2
2	20	9	36	7	34	2	30	0
9	21	4	37	4	34	6	31	7
0	21	6	38	2	33	10	32	1
4	21	3	37	2	32	9	34	6
9	20	2	36	2	32	4	30	4

LIVERPOOL.

ry.	Oats.		Rye.		Pease.		Beans.	
d.	s.	d.	s.	d.	s.	d.	s.	d.
1	17	0	30	2	28	10	28	9
5	17	5	30	9	29	9	30	5
1	16	2	31	6	30	8	25	11
5	16	9	32	2	31	4	30	7
2	17	7	33	4	32	2	32	11
9	16	11	34	8	33	6	31	5
6	17	9	35	10	34	2	29	4
10	18	0	36	6	34	6	31	11
7	18	6	37	6	35	8	32	8
6	18	7	38	0	33	10	33	6
2	18	7	37	4	32	9	32	2
3	21	2	36	2	32	0	35	0
4	22	4	34	4	31	4	34	0

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1843.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June 7.	49	6½	32	2	21	11	31	0	31	4
14.	53	2	34	5	25	4	32	0	32	7
21.	54	2	32	0	24	5	33	0	31	2
28.	54	7	32	6	22	7	33	0	33	4
July 5.	56	9	33	8	22	8	32	6	33	1
12.	58	0	35	7	21	10	34	0	34	9
19.	60	5	35	8	23	1	32	0	32	9
26.	61	9	34	10	23	0	33	0	33	4
Aug. 2.	62	2	34	11	23	4	34	0	34	4
9.	65	0	35	5	24	7	35	0	35	3
16.	58	8	32	10	23	11	34	9	35	2
23.	56	8	31	0	22	8	33	2	33	9
30.	58	1	27	4	21	8	33	6	34	1

DUBLIN.

Date.	Wheat per Barrel 20 St.		Barley per Barrel 16 St.		Bear per Barrel 17 St.		Oats per Barrel 14 St.		Flour, per Barrel 9 St.	
1843.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June 2.	28	8	13	7	11	9	9	4	16	4
9.	30	0	12	11	11	2	9	5	16	1
16.	29	9	13	2	11	9	9	6	16	6
23.	26	8	13	9	12	0	10	1	16	5
30.	27	8	13	4	11	8	9	7	16	7
July 7.	29	8	13	6	10	10	9	9	16	5
14.	29	9	13	10	10	6	10	1	17	8
21.	32	9	14	1	11	4	11	2	17	0
28.	34	1	14	2	11	6	11	8	18	0
Aug. 4.	35	2	14	1	11	10	11	6	19	7
11.	35	11	13	1	12	1	11	3	19	10
18.	33	4	12	9	12	0	10	11	20	0
25.	31	5	12	4	10	4	10	11	19	7

the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. …d 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties payable …N CORN: the Duties payable thereon, from June to August, 1843.

		Barley.						Oats.					
Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
23	0	27	9	27	11	9	0	18	0	17	6	8	0
20	0	27	8	27	8	9	0	18	5	17	8	8	0
20	0	27	4	27	6	9	0	18	6	17	11	8	0
20	0	27	7	27	5	9	0	18	9	18	2	8	0
20	0	27	10	27	6	9	0	19	7	18	6	8	0
20	0	28	8	27	8	9	0	19	7	18	9	8	0
20	0	29	0	27	11	9	0	19	8	19	1	7	0
20	0	29	10	28	4	9	0	20	1	19	4	7	0
18	0	31	2	29	0	9	0	21	0	19	9	7	0
18	0	32	4	29	10	9	0	21	2	20	2	6	0
17	0	32	11	30	8	8	0	21	9	20	7	6	0
15	0	32	11	31	6	7	0	21	5	20	10	6	0
14	0	32	10	32	2	6	0	20	7	21	0	6	0

Rye.						Pease.						Beans.					
Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
30	3	29	1	11	6	29	1	28	8	11	6	27	10	26	11	11	6
30	5	29	4	11	6	29	7	28	11	11	6	28	3	27	3	11	6
30	7	29	10	11	6	29	7	29	2	11	6	28	4	27	7	11	6
31	2	30	2	11	6	30	11	29	6	11	6	29	0	27	11	11	0
31	6	30	6	11	6	32	3	30	2	10	6	29	1	28	4	11	6
32	8	31	1	10	6	31	7	30	6	10	6	29	9	28	9	11	6
31	11	31	4	10	6	32	4	31	0	10	6	29	6	29	0	11	6
37	5	32	6	10	6	33	11	31	9	10	6	30	5	29	4	11	6
36	2	33	6	9	6	33	9	32	5	10	6	31	1	29	10	11	6
37	1	34	5	8	6	34	4	33	0	9	6	31	9	30	3	10	6
38	7	35	8	7	6	33	7	33	3	9	6	32	1	30	9	10	6
37	1	36	4	6	6	34	9	33	9	9	6	32	6	31	2	10	6
31	8	36	4	6	6	33	9	34	0	8	6	31	10	37	1	10	6

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; upon which duties have been paid for home-consumption, during the same Month; a tities remaining in Warehouse at the close thereof, from 5th June to 5th August, 1843.

Month ending	IMPORTED. From Foreign Countries.	IMPORTED. From British Possessions.	IMPORTED. Total.	CHARGED WITH DUTY. From Foreign Countries.	CHARGED WITH DUTY. From British Possessions.	CHARGED WITH DUTY. Total.	REMAINING From Foreign Countries.	Fr ti s
June 5, 1843.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	
Wheat, . .	50,328 2	314 6	50,643 0	8,075 5	1,128 6	9,203 3	259,183 0	3
Barley, . .	11,369 6	. .	11,369 6	14,065 2	. .	14,065 2	47,175 7	
Oats, . . .	1,412 3	. .	1,412 3	. .	. .	. .	40,542 6	
Rye, ...	. .	. .	. .	. .	. .	. .	57 6	
Pease, . . .	600 3	. .	600 3	221 5	2 3	224 0	24,025 4	
Beans, . .	5,630 2	. .	5,630 2	2,409 0	. .	2,409 0	114,434 0	
Totals,	69,371 0	314 6	69,685 6	25,771 4	1,131 1	25,901 5	485,418 7	3
July 5, 1843.								
Wheat, . .	36,241 1	700 4	36,941 5	2,143 3	1,291 0	3,434 3	276,260 6	2
Barley, . .	8,927 7	. .	8,927 7	9,893 2	. .	9,893 2	44,463 0	
Oats, . . .	397 6	. .	397 6	313 7	. .	313 7	37,350 5	
Rye, ...	. .	. .	. .	. .	. .	. .	57 6	
Pease, . . .	392 1	449 0	841 1	225 2	449 0	674 2	23,654 0	
Beans, . . .	2,918 1	. .	2,918 1	1,365 7	. .	1,365 7	115,538 4	
Totals,	48,877 0	1,149 4	50,026 4	13,941 5	1,740 0	15,681 5	497,324 5	3
Aug. 5, 1843.								
Wheat, . .	68,224 4	268 3	68,492 7	2,909 1	682 2	3,591 3	329,801 3	2
Barley, . .	26,567 6	4 7	26,572 5	5,755 0	4 7	5,759 7	63,901 6	
Oats, . . .	2,371 2	. .	2,371 2	. .	. .	. .	37,504 3	
Rye, ...	. .	. .	. .	. .	. .	. .	57 6	
Pease, . . .	260 3	2,042 4	2,302 1	501 7	394 3	896 2	23,139 4	2
Beans, . . .	. .	. .	.	2,655 3	. .	2,655 3	112,869 6	
Totals,	97,423 7	2,315 6	99,739 5	11,821 3	1,081 4	12,902 7	567,964 4	4
June 5, 1843.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	c
Flour, . . .	2,538 3 4	35 2 18	2,574 1 22	118 1 23	6,517 3 26	6,636 1 21	40,796 1 21	26,
Oatmeal, . .	. .	. .	. .	. .	. .	. .	41 0 1	
Totals,	2,538 3 4	35 2 18	2,574 1 22	118 1 23	6,517 3 26	6,636 1 21	40,837 1 22	23,
July 5, 1843.								
Flour, . . .	6,832 3 6	15,411 2 13	22,244 1 19	545 1 27	21,281 0 20	21,826 2 19	47,493 3 17	20,
Oatmeal, .	87 0 19	287 0 0	374 0 19	. .	287 0 0	287 0 0	9 1 16	
Totals,	6,919 3 25	15,698 2 13	22,6182 10	545 1 27	21,568 0 20	22,113 2 19	47,503 1 5	20,
Aug. 5, 1843.								
Flour, . . .	692 0 19	31,776 2 13	32,469 3 4	38 1 2	30,820 0 11	30,858 1 13	45,435 2 22	21,
Oatmeal, .	. .	941 2 19	941 2 19	. .	678 1 21	678 1 21	9 1 16	1
Totals,	692 0 19	32,718 1 4	33,410 1 23	38 1 2	31,498 2 4	31,536 3 8	45,445 0 10	22,

PRICES of BUTCHER-MEAT.

Date.	LONDON, *Per Stone of 14 lb.* Beef.	LONDON, *Per Stone of 14 lb.* Mutton.	LIVERPOOL, *Per Stone of 14 lb.* Beef.	LIVERPOOL, *Per Stone of 14 lb.* Mutton.	MORPETH, *Per Stone of 14 lb.* Beef.	MORPETH, *Per Stone of 14 lb.* Mutton.	EDINBURGH, *Per Stone of 14 lb.* Beef.	EDINBURGH, *Per Stone of 14 lb.* Mutton.	*Pe* Be
1843.									
June.	5/9 to 7/3	5/6 to 7/9	5/9 to 7/3	5/6 to 7/	5/9 to 7/	5/ to 6/6	5/6 to 6/6	5/6 to 6/9	5/6 to
July.	5/9 7/6	5/9 7/9	5/9 7/6	5/6 7/	5/6 6/9	5/ 6/6	5/3 6/6	5/3 6/6	5/6
August.	5/3 7/	5/6 7/9	5/10 7/6	5/6 7/3	5/3 6/6	5/ 6/3	5/ 6/3	5/3 6/6	5/6

PRICES of English and Scotch WOOL.

English, per 14 lb.

Merino, ...	13/	to 16/
in grease, . . .	11/	13/
South Down, ...	12/	14/6
Half Bred, ...	10/6	11/
Leicester Hogg, . . .	13/	16/
Ewe and Hogg, .	11/	13/
Locks, ...	5/	6/6
Moor, ...	4/	5/6

Scotch, per 14 lb.

Leicester Hogg, . .	12/	to
Ewe and Hogg, . .	10/	
Cheviot, white, . . .	10/	
Laid, washed, . .	7/	
unwashed, . .	6/	
Moor, white, . . .	5/6	
Laid, washed, . .	4/6	
unwashed, . .	4/	

ON THE MANURING AND STEEPING OF SEEDS.

By James F. W. Johnston, F.R.S.S.L. & E.,
Hon. Member of the Royal Agricultural Society of England.

Public attention has lately been drawn in this country to the possibility of so manuring or otherwise doctoring the seeds of our usual grain crops, before they are put into the ground, as to do away with the necessity of manuring the soil itself. It has been long known to practical farmers that, by steeping their seeds in urine, in salt and water, or in other solutions, and sprinkling them while wet with quicklime, their growth is in many cases promoted, and the rust, smut, and similar diseases, in a great degree prevented. It has been observed also in regard to potatoes, that in some soils a dusting of lime makes the cuttings more productive than they would otherwise be, and that, when powdered with gypsum, they thrive still better. The absolute effect indeed of all such applications to the seed-corn or to potatoes, will in every case be modified by the kind of soil in which the seed is sown. If the soil abound in common salt, the salting of the seed will be less efficacious, while if it be rich in lime or in gypsum, the dusting of the potatoes with these substances will produce a less striking effect. Yet the above observations of practical men shew that it is possible in certain circumstances, and by the use of certain substances, so to doctor or manure the seed we intend to sow, as to make the growth of our crop more sure, and the return of our harvests more abundant.

From this *limited* conclusion, which is justified by experience, some persons have hastily leaped to the *general* assertion, *that all seeds may be so doctored as, in all circumstances, to grow more luxuriantly*—and, still farther, *that they may be so treated as to render unnecessary any manuring of the soil in which they are to be sown.*

It is in Germany that this latter broad assertion has been most confidently made and most pertinaciously repeated. It has met with some credence also among ourselves, from persons chiefly who, like the German fathers of the statement, know a little more than the generality of practical men, but who do not know enough to enable them to see the difficulties that beset their own views, nor the limits within which their statements are true.

It will, no doubt, interest the British farmer to read the statements of those who bring forward these novel views, and to consider the degree of probability which exists as to their expectations being realized.

The great discoverer in this new line is Franz Heinrich

Bickes of Castel, near Mayence, who has published a pamphlet under the title of an "*Account of the Discovery of a Method of Cultivating the Soil without Manure*,"* in which he thus speaks:—

"The discovery—of cultivating the soil without manure—has been carefully verified in different countries, and in the most dissimilar soils.

"It is twelve years since the discovery was made, and it has, during this time, been more and more tested.

"The experiments have been made at various seasons of the year, and the same crop has been repeated on the same soil without regard to the usual rotation of crops.

"The cost is very trifling—a shilling or two an acre—and the supply of the substances used instead of manure is inexhaustible."

He then expatiates on the importance of his own discovery.

"It is not good," says Plato, "to push our investigations too far; the natural sciences find their limits, beyond which the mantle of Isis covers what is mysterious. Can any one reveal the nature of force, of life, and of motion? *The mantle of Isis is now, by this discovery, at length removed?*

"It is not the discovery of a mere crude substitute for manure but the result rests on a knowledge of the nature of plants, by which the vital power is increased in all respects, and their existence elevated and enobled!"

Here follow some of the results of his new method.

"Who can assign limits to the growth of a plant?

"I possess dried plants of wheat, consisting of fifty-six and fifty seven stalks. Indian corn, grown in a poor soil, with three or fou stems and eight or nine heads. Sunflowers eleven feet high with flower disks fourteen inches in diameter, and seeds as larg as small coffee beans. Potatoes above seven feet high, an tubers in proportion.

"Varinas and Havannah tobacco have, for eight years, preserved the well-known flavour of their native country.

"Drift sands have produced crops equal in quality to th neighbouring loams.

"All parts of the plants, stems, roots, leaves, seeds, fruit have been equally improved—the tubers of potatoes, and oth roots, are tenderer and more agreeable to the taste. Turnips ar fruits more abundant in sugar, flowers of brighter hues ar higher perfume.

"Agriculture can now be prosecuted after an entirely ne method. Manured every year almost without cost, plants w develope themselves almost spontaneously, and yield the large returns.

* Mittheilung uber die Erfindung der Boden ohne Dunger anzubauen, von Fr. Heinrich Bickes in Kastel bei Mainz. (Dusselthal bei Dusseldorf, 1843.)

rotation of crops is a mere beggary from the soil! Every fourth, or fifth year, the farmer manures a third, a fourth, fth of his whole farm, and in return he has the pleasure of his fields green without putting much into his pocket— now the most profitable crops may be raised with a luxuri- itherto unknown."

author here calculates the present cost of manuring the nd supposing the new method to cost only one-fifth, shews nany millions the adoption of it would annually save to nation in Europe. He then adds—"Consider how much 1 every country at present yields little or nothing, and yet be brought into the greatest fertility, and how many happy might enjoy life upon it who are at present a burden to ite. . . .

ook to England. What fearful want now exists in that y, the resources of which are every year diminishing. laily die of hunger, and the most talented statesmen are it hope of mitigating the evil. For several years past the f London has been paying 24,000,000 of florins of poor's while the whole of Germany pays only 60,000,000.

erlin pays annually 420,000 florins, and 40,000 souls are e. All these could find, *in the neighbourhood*, land suscep- f cultivation, on which they could not only live, but from they could pay taxes to the state." . . .

tatoes are vegetable bread; Indian corn also is wholesome hment; both grow beautifully on the lightest drift sand: *e former the whole sea-shore might be covered.*"

practical farmer will justly consider that Bickes' mode of g his seed potatoes must be something wonderful, to make grow well on the sandy downs that line so much of our . But he proceeds to give testimonials as to the efficacy method and the truth of his statements. These testimo- are from practical men in various parts of Germany, and e deserving of credit *to a certain extent*. It will be pro- herefore, to hear what they say. The first two are dated a, 1829, and are signed by four persons; they refer to own in the imperial gardens. From the second of them I the following:—"In general, the plants from the prepared exhibited a very much stronger growth, were of a deeper had thicker stems, finer and fresher leaves, larger grain, e grain was thinner skinned, and therefore contained more In particular,

°. The hemp was of a much larger size, and had many side bearing seed.

°. The Indian corn had more heads.

"3°. The buckwheat was upwards of three feet high, and full of seed.

"4°. Wheat, rye, barley, and oats are thicker, and have more numerous stems, larger ears, and more grains in each.

"5°. The Lucerne was beyond all comparison stronger, had more shoots, and its roots were as thick again.

"6°. The disks of the sunflower were doubled in diameter, the cabbage had larger heads, the cucumber large fruit, while the unprepared seed yielded nothing."

I quote further what must be considered as a mere opinion, adopted in part, no doubt, from the sanguine Mr Bickes himself:—"Since this highly beneficial discovery renders all manure unnecessary, and can be applied to the poorest soils without the necessity of having a previous stock of cattle to produce manure—which, from want of fodder, is in many places impracticable—as the material is of little cost, and as the corn crops will require less seed, its benefit to agriculture must in many respects be incalculable."

The next two testimonials are dated from Offenbach, in August, 1830, and are signed by five persons. Three of these had allowed their seed to be prepared by Mr Bickes, and thus speak of the effects when sown upon their own fields:—"The prepared wheat had from ten to fifteen stalks from each grain of seed, and the ears and grain were larger. The rye had nearly one-half more and larger grains in the row. The two-rowed barley had from eight to fifteen stalks from a single seed; generally the produce was greater than on the best fields of their farms. The prepared flax was one-half heavier in stems and seed capsules, and the latter were double in number; and when the unprepared had already become yellow, the prepared was still of the deepest green. But the potatoes excelled everything yet known in the most productive fields. From a single potato there were seldom less than ten and sometimes seventeen strong stems, while, in the best fields there are seldom more than one-third of this number."

All other plants, clover, beans, turnips, &c., are said to have been equally benefited. One-fourth only of the usual quantity of seed—of wheat and rye—was sown on a poor unproductive clay and yet the produce was greater than on the newest land of good quality, though aided by manure.

Two testimonials follow, dated September, 1831, signed by burgomasters, town-councillors, gardeners, schoolmasters, farmers and land-valuers, seventeen in number. The following is an extract from the one which relates to experiments made in a garden at Büdingen:—

"1°. Several sunflowers had a height of ten to eleven feet, the foot of the stems being eight and a-half and nine inches in thick

ess. The stems consisted of firm wood, and contained as much ombustible material as young fir trees of eight or ten years of ge.

"2°. Ten or twelve potato plants gave on an average thirty ırge potatoes each, and had stems seven feet in height.

"3°. Fifteen stalks of Indian corn had on an average five heads ıch, some having as many as eight or nine heads to a single lant,"

The next experiments quoted by the author were made at msterdam in 1834:—

"The buckwheat was four and a-half to five feet high, the flax ıd four to five stems from each seed, the Indian corn was nine ten feet in height, and had four to five heads from each seed. he white clover was as large in the leaves and stems as the red ɔver usually is; the red clover and Lucerne three feet high.

"These results were obtained from the prepared seeds alone, thout manure, on a depth of six or eight inches of the drift nds of the downs, arranged in beds for the purpose of the periments."

Between 1834 and 1839 nothing is recorded regarding the process of the author's discovery or researches, and he leaves us to 'er that, in this interval, nothing had been done—since, under the te of September, 1839, he inserts only an extract from a Mayce newspaper, containing a statement of some of the results tained in the former years. To this is subjoined one other timonial, dated November, 1841, declaring that his potatoes, wn on unmanured soil, were superior to any others in the ighbourhood of Castel, where M. Bickes resides.

I think the conclusion which is fairly to be drawn from a reful perusal of this pamphlet is, that, for a few successive ırs, the author had made experiments upon the preparing of ds, and out of a number of less successful had obtained some y interesting and striking results; that he had then laid the tter aside for about as many years more, and again, in 1841, de a solitary experiment or two, which he has incorporated h his previous results in his pamphlet of 1843. For twelve ırs, therefore, he has been more or less occupied with the ject, but during all that time he has never published or given y account of his process for preparing the seeds according to method. He is one of that class of discoverers who wish to l their secrets, and, by magnifying their importance, hope to rive a larger profit from divulging them. With such men the e friends of agriculture can have no sympathy.

I do not think, however, that his pretensions are wholly founded, or that, by a skilful study of the preparation of ds, much good may not hereafter be derived by practical

agriculture. The reasons for this opinion will appear in tl sequel.

Another German pamphlet on this subject has lately appean from the pen of a Mr Victor, an apothecary at Neiderholm, Hesse Darmstadt, under the title* of "*The Manuring of See or a Simple and Cheap Cultivation of the Soil by the Artifici Manuring of Seeds, by which, at the same time, the Rust and oth Diseases of the Corn Crops are Prevented, practically tried for Fi Years, and proved on a Large Scale.*" By C. L. Vietor. Tl author describes his methods, and is in so far more worthy the attention of the practical man. Before detailing the methods, however, I shall insert a few of his preliminary obse vations.

As the principle upon which the manuring of the seeds oug to be preferred to that of the soil, he remarks "that t manure can never be so equally distributed through the soil th the due proportion of food shall be given to each seed or plan and that, besides, before the plant comes to require it, much the organic matter of the manure has become decomposed a lost, and that even the inorganic matter is liable to assume forn of combination in which it can with difficulty be made availal to the nourishment of the growing plant."

These disadvantages, he says, may be avoided by manuri the seeds themselves which we wish to grow, while, at the sa time, the following advantages will attend the adoption of tl method:—

"1°. The same crop may be repeated on the same soil thou already exhausted, or even in any usually unfruitful soil.

"2°. We can manure the seeds with those special substanc only which it is not likely to find in the soil, or of which it h been exhausted by previous crops."

This is an advantage which is possessed by all saline a mineral manures, and is one of those benefits which will appe more clearly and strikingly to the practical man as he becon more familiar with the natural wants of the crops he wishes raise, and with the kind of substances which are present in l soils and in the manures—such as farm-yard manure—which usually employs in preparing them for the seed.

"3°. As the rotation of crops is rendered necessary chiefly the abstraction of saline substances from the soil, it may be re dered unnecessary by adding again these substances, in such way as to be within the reach of the seeds only. Thus, by stee

* Die Saamen-dungung oder einfache und Wohlfeile anbauung des Bodens du Kunstliche dungun{ }es saamens, &c. &c. Frankfurt am Main, 1843.

ing the seeds in sal ammoniac, and drying them with flour, the deficiency of salts may be supplied.

"4°. The rust and other diseases of corn plants are owing either to an excess or to a deficiency of food in the soil. These extremes can be best avoided by manuring the seed itself with the proper materials and in the proper degree. Thus," he says, "in a field of wheat after oats, upon a poor soil, a portion of the seed, which had been prepared with sal ammoniac, gave only a light crop, while another portion, prepared with oil also, gave a crop twice as heavy."

Influenced by the considerations above stated, some of which may, to a certain extent, be regarded as questionable, Victor has been induced to try the manuring of the seeds before they are sown, and, from the success which has attended his results, to recommend it to others. The substances he employs, and his mode of using them, are as follow:—

Substances employed.—1°. *Blood*, in the liquid state, is mixed with one-eightieth of its weight of glauber salts, dissolved in a little water; when thus mixed, it may be kept for a long time in a cool place without congealing or undergoing decomposition; or clotted blood may be dried either alone or mixed with a little earth or powdered clay, and then reduced to fine powder.

2°. Wool, hair, parings of leather, horns, hoofs, and bones, are charred in close vessels, until they are capable of being reduced to powder.

3°. The dung of all animals is dried and reduced to powder.

4°. Fats and oils of all kinds are mixed with so much earth, clay, or rye-meal, as will enable the whole to be reduced to powder. Oil-cakes are also powdered for use.

Mode of using them.—He makes up a semi-fluid mixture with which he mixes the seeds, and then he dries up the whole by the addition of the powdered manures already prepared. His semi-fluid mixture is thus prepared:—For a bushel of wheat or other grain, take

- 20 to 30 lbs. of clay in fine powder.
- $1\frac{1}{4}$ lbs. of pounded sal-ammoniac, or 3 lbs. of common salt.
- 3 to 5 quarts of whale, rape, or other cheap oil.
- 15 to 20 quarts of fresh blood, or blood kept in a fluid state by means of glauber salts, or, in the absence of blood, as much water.
- 3 to 5 lbs. of lintseed meal or pounded oil-cake.

These are mixed together intimately, and water added, if necessary, to make a half-fluid mass. The seed is then to be poured in and stirred about till every seed is completely enveloped by the mixture. A layer of one of the following dry mixtures is then spread on the floor, over it the manured seed, and then

another layer of the dry powder. The whole is then stirred together and left to dry.

Dry Mixtures.—Of these drying mixtures he describes several, consisting chiefly of powdered clay, mixed with one or other of the dry powders already mentioned. Thus he recommends mixtures of

1. 75 of powdered clay, 8 horn shavings, and 17 of bone dust.
2. 85 of clay, with 15 of fluid, or 5 of dried blood.
3. 85 of clay, 5 of charred hair, and 10 of oil-cake.
4. 60 of clay and 40 of powdered dung.
5. 70 of clay, 25 of charred leather, and 5 of bone dust.
6. 80 of clay, 1 of fat, tallow, or oil, and 2 of powdered dung.

These are all to be finely powdered and intimately mixed. The principal alleged use of the clay is, to make the other substances cohere together, and to attach them more strongly to the grain.

When the mixture of grain and manure is dry, it is broken up with the hand and thrown upon a fine sieve, which allows the loose powder to pass through and the uncovered grains, and then upon a coarser sieve, through which the dressed seeds pass, leaving the lumps, in which two or three seeds may be present, and which are to be carefully broken up. He prescribes further, that much caution is to be used in completing the operation so quickly that the grain may not be permitted to sprout, and thus become liable to injury during the succeeding operations.

When it is wished to grow corn after corn in fields manured in the usual way, Vietor recommends mixing, for each bushel of seed, two to three pounds of sal ammoniac, or four to six pounds of common salt with ten to fifteen of rye-meal, adding a little water, stirring the seed well among it, and drying the whole in a stove.

Such is the substance of Vietor's pamphlet and observations. I have stated them pretty fully, because I think he deserves this much at the hands of those who are interested in the progress of practical agriculture; because he has stated the reasons for his procedure, has described his processes fully, and claims neither great merit nor great reward for alleged great discovery. Besides, there is a show of reason in what he states. For though we may very fairly doubt, or perhaps entirely disbelieve, that the quantity of manure with which he envelopes his seeds can be sufficient to supply the wants of the crop that is to spring from them, yet there can scarcely be a more economical way of employing the same quantity of manure—one in which there will be less waste of it, or in which it will be more useful to the growing plant. In every way of applying manure to the soil which has hitherto been adopted a large portion never reaches the

roots of the plants. Even when drilled in along with or near the seeds, a notable quantity escapes from the neighbourhood of the roots, and is more or less completely lost to the crop it is intended to feed. Such must obviously be the case to a very much smaller extent where it is in actual contact with the seed it is to nourish, and actually envelopes it.

Still it is doubtful whether the gain or saving effected by this method will be equal to the cost of time and labour which it involves. Should such a mode of manuring be found easily practicable, more skilful mixtures than those of Vietor—such as would be more certain to succeed, and such as would be fitted specially to aid the growth of this or that kind of crop—could easily be suggested.

In illustration of this opinion, I will here briefly state the facts from which I am led to believe that considerable benefit may in reality hereafter accrue to practical agriculture from a careful study of the effect of certain known steeps or prepared mixtures upon the after growth of the seeds upon which they have been tried.

1°. The quantity of inorganic matter contained in the grain of wheat, oats, barley, &c., is comparatively small. In wheat and barley it varies from 1½ to 2 per cent. of the whole weight; in oats it is about 3½ per cent., but a considerable proportion of this is contained in the husk with which the oat is usually invested. But, though small in quantity, this inorganic matter is absolutely essential to the perfect condition of the seed, and to the healthy growth of the plant that springs from it.

2°. When seeds are steeped in water, they swell and increase in bulk. They absorb a portion of the water and of any saline substances it may hold in solution. Now, if the small quantity of saline or inorganic matter which exists in seeds does really promote their growth, may not a larger quantity promote it more? May not the growth be more luxuriant if the seed be steeped in water containing saline substances in solution, and be thus made to absorb an additional proportion? It does not appear unreasonable to suppose that a bushel and a-half of seed-wheat may be made to absorb a pound of saline matter. This appears, indeed, to be only a very small quantity, and yet, if absorbed, it would add one-half more to that which the seed naturally contains. We cannot pronounce beforehand, with absolute certainty, that by this absorption the growth of the seed would be greatly promoted, though both theory and practice concur in rendering it probable. Thus the experiments of Bickes—whose mode of preparing seeds appears to be a simple steeping in saline solutions—appear decisive in favour of the opinion that such artificial additions to the saline matter of the seed do really, in some cases at

least, greatly promote the growth of the seeds, and increase the luxuriance and produce of the after crops.

The fact that saline manures are beneficial, in many cases, to the growing crop, when merely applied to the soil, is in favour of the same view. The salts, it is true, when applied to the soil, enter the plant by its roots; but, nevertheless, their action is simply to yield saline matter to the plant in larger quantity than it could otherwise readily obtain it from the soil. This additional supply might at once be given it, to a certain extent, by steeping the seed itself.

3°. Further, we know that some seeds germinate much more readily and certainly than others. We know, also, that the proportion of inorganic matter, or of ash they leave when burned, varies in different samples of seeds of the same kind. That contained by wheat, for example, is sometimes $1\frac{1}{4}$, sometimes $1\frac{3}{4}$ and sometimes nearly 2 per cent. of its weight. Can this difference in the growth of seed and the difference in the proportion of saline matter have any connection with each other? Do some germinate feebly, do others fail entirely, because they contain too small a proportion of the usual saline constituents of the seed? Would they germinate better if more were by some means given to the seed? The same experiments of Bickes, upon the effect of steeping, seem almost to answer these questions in the affirmative; they, at least, render it very probable that some such relation does exist between the two differences to which I have alluded. The same may also be said of the observation made by M Fleming of Barochan, that seed wheat, which had been dressed the previous year, with certain saline substances, grew more luxuriantly, and gave a better crop than that which, though grown on the same field, had not been so top-dressed. It is not very unreasonable to suppose that this better growth of the dressed seed might be owing to its having obtained, from the substance applied to the soil, a larger proportion of saline matter than that to which no top-dressing had been applied.

Still these circumstances only render probable the opinion to which I have adverted. They point out, however, new series of researches both in the field and in the laboratory, by which the opinion will be tested, and either refuted or confirmed. In the field, experiments must be made with different seeds, dressed and undressed. In the laboratory these seeds must be examined, the proportion of inorganic matter they respectively contain determined, and if this inorganic matter be equal in quantity in seeds exhibiting different powers of germination and growth, the difference in the kind or quality, as well as in the quantity of the ash, must be more or less rigorously ascertained. By these united methods of investigation we may hope, by and by, to make out what are likely to be the rea

and constant effects of steeping upon seeds—to what kind of seeds or roots it may be applied most beneficially—under what circumstances this treatment ought to be especially adopted—what kind of saline substances ought to be applied to each species of seed, and in what proportions—and what is the nature of the influence they may be found to exercise in promoting or otherwise modifying the growth of the after crop.

In the meantime, there are two principles by which our trial of steeps ought to be regulated, by which the saline substances we may employ with advantage in our first experiments in the field and upon different crops are distinctly pointed out. In a future paper I shall explain these principles, and state the practical suggestions which may be drawn from them in regard to experiments upon the steeping of roots and seeds.

Durham, 20*th November*, 1843.

ON THE FORK OR SPADE HUSBANDRY.

By Cuthbert W. Johnson, Esq., F.R.S.

That increasing the depth of a cultivated soil adds materially, in the great majority of instances, to its powers of production, is a fact almost universally admitted. The practice of this excellent mode of improving the soil is not nearly so extensive as is desirable, and for this neglect one or two reasons may be assigned:—The subsoil-plough, to which such an impetus has been given by Mr Smith of Deanstoun, has been tried in much too careless a manner, and with too little discrimination, for it to be universally popular—its effects too, on many soils with stiff clay substrata, are neither remarkable in extent nor soon apparent. On such land the subsoil is not sufficiently broken, the earth merely rising or swelling in the trench, and speedily settling to nearly its former firmness. On such soils the spade, or, what is infinitely better, the fork, generally produces much better effects—the soil is more broken, and the subsoil better interspersed with small cavities, to which the air penetrates, and through which the superfluous water of the soil escapes, and the roots of the cultivator's crops extend with greatly increased facility. The advantages of this plan, as stated by Mr Morton in his valuable little work on soils, is well illustrated by the practice of the more scientific gardeners who, when about to pot any plants, put some broken tiles or gravel in the bottom of the pots, to drain the superfluous moisture from the plants to the hole in the bottom of the flower-pots; and, when

they use an adhesive or clay soil, instead of passing the soil through a sieve, according to the old custom, they now chop it into small pieces, and thus give to strongish clay soils an artificial porousness which they do not naturally possess. On examining the roots of plants growing with their soil thus prepared, we find the crevices between the broken pieces of earth full of roots; because they have not only a more easy passage where the soil is friable, in consequence of the lumps keeping the earth loose and porous between them, but here the drainage is more complete. Perfect drainage and deep ploughing are indeed the true principles for increasing the fertility of a soil; for by these means the plants are enabled to push their roots farther and deeper in search of food, which nutriment they obtain of a more healthy kind than when the soil is imperfectly drained and ploughed shallow. All tenacious soils, adds Mr Morton, should be trenched or subsoil-ploughed once in every course of crops, or when they are in fallow. This practice not only gives to the roots of plants a greater scope to go in search of food in dry weather, but also furnishes a depth of porous substratum, under the soil, to draw off the superabundant moisture during continued wet weather, and transmits moisture in the atmospheric air to the roots of plants in continued drought. If, on the contrary, a soil resting on a retentive subsoil is merely well pulverized to the depth of the furrow slice, it soon, in continued wet weather, gets into a state unfit for vegetation; the water becomes stagnant, and all the soluble matter in the soil is dissolved and carried off, and, when the soil again becomes dry, it is as hard and solid a mass as bricks ready for the kiln. In either of these states it is impossible for any plants to vegetate with vigour, the soil being at one time as soft and smooth as well-tempered mortar, and at another almost as dry and hard a mass as a stone.

But when the soil is artificially deepened, by fork or spade trenching, or with the subsoil plough, the substratum is made porous to a much greater depth. The rain gradually sinks down to the whole depth of the porous substratum, and from thence to the furrow drains, and, in time of great drought, the deep-moved ground will hold, by capillary attraction, a much greater supply of moisture for the nourishment of plants; so that thoroughly deepening and loosening the soil, not only assists the escape of the superabundant water during heavy rains, but it affords additional means of supplying healthy vegetation with moisture at those times when it is most needed.

I have recently witnessed some rather extended operations in the introduction of the fork husbandry into farms of a considerable extent, to which the farmer's attention can hardly be directed without benefit, and in this I do not allude to what is only prac-

ticable on a small scale—the exclusive fork husbandry—but to the use of the fork in conjunction with the plough. Some of these experiments have been carrying on for the last five years by Mr James Beadel, a very intelligent and excellent farmer and land-agent of Witham, in Essex, on a farm of about 120 acres, whose soil is light, resting upon gravel. He observes, in a recent obliging communication :—

I have annually dug from three to five acres for the last five years. The soil I have operated upon is light, with a substratum of gravel, sand, and tender loam. The expense for the forking is 2½d. per rod = 38s. 8d. per acre; but I always dig under the furrow left by the plough, which adds one ploughing to the expense, viz. 8s. By adopting this course, I do not bring up the inert subsoil till the second time of digging. The influence of forking on the crops seems to be that all root-crops are much increased in quantity, the cereal crops which follow less injured by drought, and the land becomes much more free from annual weeds, as well as from those which are of a more permanent nature. I had recently a person with me who has made a series of very carefully-conducted experiments, in which digging has been contrasted with ploughing. He tells me that he thinks the produce of the forked land was nearly double that of the ploughed.

And, when alluding to the comparative advantages of the spade and the fork, Mr Beadel adds—

1st, A man can dig a greater quantity of land in a given time with the fork than he can with the spade. My experience proves one-sixth, and it strikes me it must be so; because the chisel-pointed ends of a three-pronged fork can be more easily pushed into a hard subsoil than the continuous end of a spade. *2dly*, It does not bring up so much of the subsoil as the spade, but mixes the earth more, a great portion slipping through between the prongs. *3dly*, The bottom is left more uneven and broken by the fork, which I consider a great advantage. One great objection to the plough is, I think, the smooth, glazed surface which it leaves below, and which in many cases, I fancy, presents too great a resistance to the delicate fibres of the plant. If, too, it is correct that in most instances the present surface soil is nothing more than a portion of the subsoil improved by cultivation, it must be right to increase the quantum of corn-growing earth by subjecting more subsoil to the same operation.*

The attempt thus described by Mr Beadel (and it is a successful effort too) is one which was, with equal success, and on a still bolder scale, attempted in Norfolk, by Mr Mitchell—an effort which the late Dr Yelloly reported to the British Association, and that portion of his remarks which allude to the results obtained I will give in this paper, since it answers very completely certain practical questions as to the working of the fork husbandry which are sure to be proposed by those who have not witnessed the working of the system.

The farm of Wattelfield, in the parish of Wymondham, where the fork husbandry on a bold scale was first introduced, some time previous to 1837, by Mr Mitchell, consists of about 317 acres, of which 207 are arable, and 110 in pastures and planta-

* On the hungry gravelly soils of Lexden, in Essex, now farmed by Mr Errington, a very considerable portion has been forked over within the last two or three years with the most perfect success. The Swedish turnips produced on these soils, in the season of 1843, far exceeded in produce those of any other fields in the district.

tions. The digging was at first carried on with the spade, but this was speedily exchanged for a strong three-pronged fork, o: fourteen inches deep, and seven inches and a-half wide, which is found to be more manageable and less expensive than the spade This fork cost 4s. 6d. instead of 6s. 6d., weighed 8 lb., and when worked down, could be relaid at a trifling expense.

The digging is effected by taking in about four inches o earth at a time, pressing perpendicularly, and getting to a prope: depth at two thrusts. The earth, however, is not turned out o the trench to a greater depth than ten inches, although the forl may get down as far as thirteen or fourteen, but that whicl remains at the bottom in the state of what is called "crumbs" answers the purpose equally with the earth which is thrown out of forming a permeable medium for the roots of the plant whicl is to grow in it. The men prefer working together, in orde that their labour may be, as nearly as possible, on the sam description of soil, but each takes in about nine feet in width so that his work can be easily measured. The plan is to have breathing about every half hour, and the men never work more thai the regular ten hours per day. Digging is, however, more laboriou than the usual operations of agriculture, though it is much les so with the use of the fork than when the spade is employed The labourers work the land in ridges of about nine feet i width, and the furrows dividing them are sometimes made b the plough previously to the digging, and sometimes by th management of the labourers.

The men receive for the ordinary digging after a white cro from 2d. to 2½d. per rod, of thirty square yards, the price varyin according to the tenacity of the soil. Where the land is to hav a fallow crop, such as turnip, mangel würzel, or cabbages, (for n part of the farm or the land in the immediate neighbourhoo has ever a naked fallow,) there is first a ploughing, which done at a season when the horses can be best spared, and afte: wards a digging at from 1¾d. to 2d. per rod. In preparing f a fallow crop, there is also an expense incurred in harrowir and in raising a ridge with the plough, which last, is worth abo 7s. per acre.

The men are paid the usual wages of the neighbourhood : harvest; but as the whole number ordinarily employed are n required at that period, those for whom there is no occasion d perse themselves amongst the neighbouring farmers, with t understanding that they may resume their employment wh harvest is over, which they are always happy in doing. T ordinary earnings of a labourer in digging are from 11s. to 1: per week.

It is to be noticed that Mr Mitchell has always plough

clover lay for the succeeding crop, not dug it, and that the horses, when not wanted for other purposes, are employed in assisting the diggers in preparing the land for seed. Twenty labourers are kept upon the farm instead of thirteen, who would be necessary under the ordinary system, and five or six horses instead of twelve. As the demands upon these horses, in hay and corn harvest, are considerable, a good proportion of the hay and corn is stacked in the fields where they are grown.

It is hardly necessary, in support of these facts, to refer to the very considerable and successful extent to which the spade husbandry prevails in many of the Continental states, such as in the north of Spain, France, and Flanders. Of the last the Rev. W. Rham observes—

The husbandry of the whole of the north-eastern part of East Flanders, where the soil is good sandy loam, may be considered as a mixed cultivation, partly by the plough and partly by the spade; without the spade it would be impossible to give that finish to the land, after it is sown, which makes it appear so like a garden, and which is the chief cause of the more certain vegetation of the seed. There is also a great saving of seed by this practice, as may be seen by comparing the quantity actually sown in Flanders with that required in other countries where the spade is more sparingly used. In large farms in England, the spade is only used to dig out water furrows; but in Flanders, where the land is usually laid in stitches of about six or seven feet wide, the intervals are always dug out with the spade, and the earth spread evenly (*sifted* as they call it) over the seed which has been harrowed in. The trenches are so arranged that every year a fresh portion of the ground is dug out, and in six years the whole land will have been dug to the depth of, at least, one foot. In the next course, the trench is dug a few inches deeper, which brings up a little of the subsoil, and, after four or five such courses of trenching, the whole soil comes to be of a uniform quality to the depth of from eighteen to twenty inches, a most important circumstance to the growth of flax, potatoes, and carrots. In the Waes country they proceed differently, for they have a soil which, by repeated trenchings, has long been uniform in quality to the required depth; there they regularly trench one-sixth part of the land every year, and plant it with potatoes or sow carrots upon it.*

If we direct our attention even to those cases where small plots of land are *exclusively* farmed, not gardened, by the spade or fork, the result is still more satisfactory; and here, too, the good effects produced, the strangely enlarged fertility of the soil, is almost entirely attributable to the deep forking. Let any traveller by the south-western railway (to take at once an extreme case) notice the results of deep stirring in some of the little cottage gardens enclosed from the heaths of Woking and Bagshot—let him witness the luxuriant little crops of both wheat and the common culinary vegetables growing in the gardens of these little peasants' nests, all looking as thriving and as luxuriant as possible—and yet this effect is all the work of the deeply-penetrating fork or spade. Let the passenger compare these with the surrounding heath-covered lands, and it will be impossible for him to arrive but at one conclusion. The distant cultivator

* Journal of Royal Agricultural Society, vol. ii., p. 43.

will judge at once of the natural poverty of the soil of Bagshot Heath by its chemical composition. It contains in 400 parts, after being heated to redness, of

Coarse siliceous sand,	380 parts.
Fine siliceous sand, . .	9
Clay, oxide of iron, and carbonate of lime, . . .	11
	——400

And it is not to the sandy soils that the benefits of fork husbandry are confined. On the chalky soils of Eastbourne, during the last few years, a considerable extent of land has been let out to about 400 little spade-cultivators, holding, as regards extent, in every proportion, from a few square rods to as many acres. One of these, George Cruttenden, a schoolmaster of Willingdon, reports, April, 1842:—

The quantity of land I rent is five acres, on the side of the South Downs, at £3 per acre—this, with £10 for my house, makes £25. I have now three cows, a heifer, and a calf, standing opposite to each other, with a road between the mangers for feeding these stall-fed cattle. I am satisfied that I can keep two cows on the same quantity of land, stall-fed, that I could keep one if I allowed it to graze.

It is true that in this last successful instance, Cruttenden keeps a thriving little agricultural school, whose scholars, in return for their tuition, assist him in the cultivation of the five acres, (these yielded him a clear profit of £40 in 1842,) let us, therefore, take another instance, in another portion of the kingdom, on another soil, a heavy clay, and where there is not any supply of free labour to assist the fork-cultivator; let us examine the instance produced by Mr Fardon of the Firs near Bromsgrove, from which we learn that Samuel Bridge of Stock Green, near Feckenham, Worcestershire, has about four acres of very inferior stiff clay land on the blue lias, which he has occupied, two acres for sixteen or seventeen years, and two acres for twenty-seven years. He grows annually, it appears, wheat and potatoes, with about a quarter of an acre of beans, the crop being, of course, shifted alternately from one division to the other. His system of cultivation is this:—As soon as the wheat is off, he breast-ploughs his stubble-ground, raking up the stubble to litter his pigs; he then digs it over with a fork, and plants on it potatoes in the following spring; this crop being kept clean, the land needs no further preparation for wheat. He does most of the labour himself, but he estimates it to amount to about £4 : 6s. per acre; his average produce has been rather more than forty bushels of wheat and twelve tons of potatoes per acre. The system he follows as regards the cropping of the land, therefore, is evidently of the most trying description; and this is not all, for he sells all his produce, even his straw, excepting a

:atoes and beans, which he consumes in annually feeding thirty or forty score of bacon for his own consumption. ers his pigs with the potato haulm and stubble, and the › from this source, and from his privy, with some clay his ditches, which he gets occasionally and burns, is all › has to fertilize the land with.

'ing out of consideration the small quantity of beans raised con fed, valuing the wheat at 7s. per bushel, and the rest ›roduce at the price he obtains for it, we shall have some-ike the following account of his farming :—

'ons of Potatoes, at 50s. per ton,	£60	0	0			
'ushels of Wheat, at 7s. per bushel,	28	0	0			
'ons of Straw, at 50s. per ton, .	5	0	0			
				£93	0	0
from this, manual wages at £4 : 6 : 1¼ ‹cre, ...	17	4	6			
otatoes for two acres, 25 bags of lbs. at 4s.	5	0	0			
els of seed Wheat, at 7s. 6d., .	1	10	6			
				£23	14	6
him, subject to Rent and Parochial aents, ...				£69	0	0

ıel Bridge, then, gives strong and unanswerable evidence in of the fork. He adds, too, this important testimony, that ıs pursued this system of cultivation during the whole of the last twenty-four years, with the exception of the ree years, when his neighbours *ploughed* his land for him *:ing*. That they are willing to do the same now, at any ut he *prefers going to the expense of digging it to having it d for nothing.*"

an error into which, however, the farmer very commonly conclude that there is any material difference in the *earthy* ition of uncultivated soils and the substratum; for, gene-eaking, the only difference between the surface soil and ıtum on which it immediately rests consists in the upper taining a larger proportion of soluble and decomposing matter. It is only the absence of these from the tum which renders it, when too copiously mixed with the soil, rather prejudicial *at first* than otherwise; and this is son why the fork is preferable in the first instance, of ng the soil, to the spade or to very deep ploughing, ıe fork deepens and loosens the soil, perhaps to a greater than either of the other implements, but then it does not › the *surface* so much of the substratum.

There is no doubt with regard to the similarity of composition in the different soils and subsoils. The principal mineral in the soil of any district, as Mr Morton observes, is that of the geological formation under it; hence we find argillaceous soil resting on the various clay formations, calcareous soil over the chalk and oolitic rocks, and siliceous soils over the various sandstones. On the chalk, the soil is white; on the red sandstone it is red, and on the sands and clays the surface has nearly the same shade of colour as the subsoil. And, in fact, we perceive a change in the external appearance of the surface wherever there is a change in the subsoil below.

If, then, these are correctly stated facts—if such superior fertilizing effects are produced by the use of the fork beyond those which follow the plough—ought we not indeed to rejoice? Should we not exult that here is opened to the cultivator another source of fertility; one, too, not confined to any particular locality, not requiring the use of other agents than the sinewy arms of the agricultural labourers. Its general adoption, indeed, will afford a greatly extended supply of field work—labour, too, of the most healthy, the most valuable kind—carried on in the broad light of heaven, far away from the crowds, the diseases, and the other miseries which attend the densely congregated citizens.

ON THE CAUSE OF THE UNHEALTHY STATE OF THE FIR PLANTATIONS IN ABERDEENSHIRE.

By Mr John Brown, Forester at Arniston, Mid-Lothian.

In these times of improvement, and in Scotland more especially a country whose inhabitants boast of their daily progress towards perfection in all that is considered useful or ornamental, it is remarkable that the valuable art of *Arboriculture* is left behind and that merely because the difficulties which lie in the way require a little perseverance to remove them, in order to bring the science to an equality with many others which are of far less value to the real welfare of our country. This assertion is particularly applicable to the north and north-eastern parts of Aberdeenshire; for there, in many parts, we may wander mile after mile and scarcely see a patch of cultivated land or a single tree to gratify the eye. This state of things is the more remarkable when we consider that a very great part of that land which, in the truest sense of the word, is at present *waste*, might, by proper management be made a source of wealth to the proprietors, a

well as a means of comfortable living for many industrious poor people of our country. The soil on those tracts of waste land in the county of Aberdeen is, it must be confessed, naturally of a poor description, but not more so in general than many parts of cultivated land in the same part of the country, and which, at the present day, yield considerable crops of grain, although this very soil was, not many years ago, just in the same condition as that which we now see lying waste in its vicinity. Its improvement, therefore, only requires perseverance on the part of cultivators and encouragement on the part of the proprietor. It must be evident to every observant Scotsman that the spirit of improvement, as regards the bringing in of waste land, and *the raising of healthy plantations* upon the same, is rather upon the decline than otherwise among the proprietors of the north. It has indeed been argued, and the opinion is yet entertained, that the greater part of the *waste land* in the *north of Scotland* is unfit for raising either grain or wood. No doubt many attempts have been made towards those ends, and many a sad failure has attended those attempts, which has discouraged many an enterprising spirit. But the question is, Did those who failed in their useful endeavours go about the work in the right way? Did they use the right means for gaining the end they had in view? From the failures which we have seen take place, we must conclude that they had not gone properly to work. Now this is just the very thing that I mean to point out, namely, the cause of the many disappointments which have been experienced in the county of Aberdeen in the raising of young fir plantations. But, previous to entering into detail upon the bad method of planting which has hitherto been practised in the county in question, I will make a few general and necessary observations, and also examine into the cause of the present unhealthy state in which we find many of the older *fir plantations* in the same part of the country.

Having myself acted in the capacity of forester and general overseer upon a gentleman's estate in the northern part of Aberdeenshire, I often had occasion to witness the present neglected state of many full-grown fir woods in that county—woods which, at the present day, are actually an eye-sore to the proprietors, as well as giving a mean idea of our country to strangers passing through it, but which might have been, with proper care and attention, an ornament to the county, as well as a source of wealth to the proprietors.

In the north of Scotland, the forester and farmer ought to go hand in hand; for, owing to the nature of the climate, the first process is to secure shelter, and this, I am convinced, is quite attainable by industry and perseverance.

Perhaps the principal cause of the mean appearance of many

of the Aberdeenshire plantations is to be attributed to the wa
of due care having been taken with them in their young a
growing state; and, indeed, had the soil been of the very b
quality, we often find these plantations very improperly laid do
in the manner of distributing the trees in their respective sit
tions. A person acquainted with the general habit and nat
of trees, sees at once where the fault in a great measure li
thus we often find, at the first glance upon the side of a wo
trees which, from their tender nature, ought to occupy the inte
of the plantation, planted upon the outside, and also upon
most exposed side. It must follow, as a natural conseque
that the trees thus planted must have a stinted appeara
while their more hardy neighbours, being planted inside, rec
too much shelter, and, consequently, are drawn up wea
How could any other thing be expected than that the wh
plantation should have a distorted appearance, and tend mor
disfigure the country than to prove ornamental or useful?
scene, however, is greatly changed when within view of a
prietor's seat, which is often to be seen in the centre of a
glen or valley, and surrounded, in many instances, with thri
and healthy plantations, and consisting, for the greater par
Scots, spruce, and larch firs, which give a lively appearanc
the place in winter as well as in summer; but as soon as we
the proprietor's home-domain we come again into the old dr
scenery.

On examining the woods at Craigston, near Turriff, the sea
William Urquhart, Esq., I saw that one old system of plan
had invariably been adopted, and made to answer all circ
stances; and if the circumstances did not naturally agree
the adopted system, the natural consequence was failure. I
that the system had proved ruinous in its effects, and which c
not be averted in a short time. I therefore proposed goin
work with caution; and Mr Urquhart being himself a frien
improvement, I was glad that I had his encouragement. Wh
speak, however, of the woods at Craigston, I only take it as a
for the whole; for I found the fir woods in other gentlem
places in the same condition.

A considerable quantity of wood being required just a
the time I went to Craigston, we set about thinning a planta
of larches, which were very close, considering their age
size—the average being about six inches in diameter, and
stood about three or four feet distant from each other. Wh
put my knife into the bark, for the purpose of marking the t
for cutting, I was surprised to find the inner bark of a brown s
ed colour, and, as soon as the tree was felled, I examined
found it to be rotten in the heart. In the act of markin

found several of them quite fresh in the outer bark, and these I found to be sound in the heart also; so that, before we had many of the trees cut, I could, from the appearance of the inner bark, in the act of marking, point out a sound tree from an unsound one, and this circumstance proved of great use to me afterwards, as I could, by making a slight cut into the bark, decide perfectly whether the tree was sound or not. I may observe that the trees had all the same appearance outside in their growing state, and I could not have decided upon the soundness till I put my knife into the bark.

Now the question naturally arises, What could be the cause of those trees being thus wasted in the heart; they being, with propriety, what might be termed trees in the vigour of their growth, considering their age? I learned from the person who acted in the same situation before me, that the trees might be about twenty-five or thirty years planted, and as he had been in the same situation, and upon the same place, for upwards of fifty years, he had a right to know the fact. The trees of this age ought, in ordinary circumstances, to be in the strength of their growth; and a person acquainted with the growth of timber may, at first sight, have a competent knowledge of the progress they had made in past years. I examined and found that the trees under our notice had made rapid progress from the eighth to about the eighteenth year of their age, after which period they had gradually diminished in growth, each succeeding year growing less, both in height and girth: in short, the year in which they came under my notice, the greater part of them had almost ceased to make any new wood at all. And no wonder they had yearly decreased in growth; for they had never till now been thinned, and they had grown just as nature directed them, from the first year they had been planted till the time I examined them. Was it possible, let me ask, that trees nearly thirty years old, averaging twenty feet in height and six inches in diameter, and standing only three or four feet apart, could be in a healthy, growing state? Every gardener is aware, and the ordinary laws of nature will teach the most obtuse observer, that any plant, to be allowed to reach to its natural size, requires a space of ground corresponding to the size it naturally attains under ordinary circumstances: in short, if any plant has not sufficient space, corresponding to its natural vigour of growth, premature old age must overtake it at an early stage of its existence. Here, then, is the whole mystery. The trees under notice being confined within the narrow limits of three feet, plant from plant, ought to have had a space not less than half their height; and, consequently, not having room to push out their roots, they naturally failed to make wood;

and, as we always see an old tree give way in the heart first, so did these, upon the same principle, only, in their case, premature old age had been brought upon them through the want of space to collect the nourishment which is necessary to carry on the functions of nature. I cut the greater part of these trees down for the purpose required, leaving a few of the most healthy as an experiment, to try how they would succeed after having a clear space around them: but, the situation upon which they grew being rather an exposed one, I had little hope of their doing much good afterwards; because we find it a general law of nature, both as regards the vegetable or the animal kingdom that if any individual be suddenly exposed to the weather, from a sheltered state, it seldom can endure so sudden a transition.

The person who had the charge or management of the wood prior to my going to the place, had in his eye immediat shelter more than the welfare of the wood in general; and suc management shews little foresight. By another method of pro cedure, which may now be evident, after what I have saic shelter might have been gained, though perhaps not so imme diate, yet more lasting, effective, and profitable in the end for any system which induces unhealthiness in trees can neve rear them so as to produce efficient shelter. Though my obse vations refer only upon one part of the woods at Craigston, may state that the observation here made upon the one pa was equally applicable to the whole of the old woods about th place, excepting that, in thinning Scots fir equally as thick an old as the larch, I found very few spoiled in the heart. I foun from experience, that, all these firs being alike situated, th spruce suffered first.

We generally cut down and sold a considerable quantity wood yearly at Craigston; and continual disappointment wa found in cutting them down; for trees which, to a strang coming to purchase, appeared fresh and good of their kind wh standing, were found, when cut down, worth very little a co siderable way up the trunk. In these woods, trees twen inches in diameter stood within five feet of one another; so tha while cutting, we came to the resolution that, instead of thi ning, we should cut them clean forward; because those whi were fresh were so much drawn up that they would not sta when left exposed. The general error evidently is the wa of thinning at a proper stage of their growth, and all th arises from the mistaken idea that woods will not grow an exposed situation unless thickly drawn up together. I doubt the plan may do for a time, but where is the val of the wood thus managed in the end?—as I have alrea pointed out. We often see a good healthy tree standing th

storm, unsheltered and alone, in the coldest part of the country; and why should it not, if properly managed, do so equally well standing at a convenient distance from neighbours.

With regard to the state of *young* fir plantations in Aberdeenshire, it must be confessed that they are generally in a very unpromising state, and very far from being what they ought to be. I shall also endeavour to point out the cause of their unhealthiness; but, previous to doing so, it will be necessary to examine into the nature of the soil generally planted with fir plantations in Aberdeenshire; and this I have done personally very minutely, for the purpose of being able to explain to others the cause of the failure I am speaking of. When I went to Craigston, I was much surprised at seeing young fir plantations extremely unhealthy in their appearance, and, judging externally of the situation in which they were planted, they might have been much better than they were. The truth is, I was puzzled to account for the unhealthy state in which I found many of them.

I may here take, as an example, a plantation of spruce and Scots firs of eighty or a hundred acres, the trees in which more resembled shrubs than trees. They stood only about four or five feet in height, and, I believe, they could not be less than twenty years old, and each bush of that height, spread out wide, forming a figure much resembling that of a Rhododendron shrub. To have looked upon this plantation from some distance, one would have thought it a mass of low-spreading evergreens, instead of young forest trees. There were, in the same neighbourhood, and adjoining these just mentioned, trees of the same sort in a fair state of health. Upon comparing the different cases, I concluded that the blame could not be attributed to climate, but that the fault lay in the soil. I accordingly examined, and found the soil to be as follows:—Upon putting the spade into the upper soil, I found it in many places only five inches deep, seldom exceeding eight inches in depth. Upon taking off the upper stratum with the spade, I found the top of the subsoil hard and impenetrable, so as to resist the action of the spade in my efforts to get into it. I examined many other places, and found the hardness generally to exist throughout upon the top of the subsoil. Upon breaking through the subsoil with a pick, I found it to consist in many places of rotten rock; but in most parts it consisted of coarse gravel, with fine sand intermixed. I reasoned with myself what could be the cause of this crust being formed upon the top of the subsoil. The upper soil was an entire bed of peat, or decayed vegetable matter, formed, of course, from the remains of decayed plants which had grown upon its surface. The subsoil, in fact, was covered with muirband-pan, through which the roots of the young trees could not penetrate, and hence their sickly appearance.

The method of planting young trees hitherto practised upon that soil was by notching or pitting. If we consider both these methods separately, we shall find that neither of them had answered upon soil such as that just pointed out. It is well known that notching the ground for young trees, is simply to make a cut in the turf, and open up the same with the spade by another transverse cut, put the young tree into the opening, and close the same upon the tree with the feet, making it close and tight by beating with the heels. With this system of notching, which is the easiest of all systems, the young tree grew as well as it could upon the damp peat or upper soil, for the first few years; but, this top soil being shallow, the roots of the young trees spread along under it, and, not being able to penetrate the hard crust upon the subsoil, and having only a few inches of soil to grow in, the trees, being thickly planted, soon exhausted the natural powers of so thin a soil, and could grow no more.

With regard to pitting in the same soil, that is, making a small pit of about eighteen inches in diameter for each plant, the subsoil was broken through and mixed with the top stratum, the pit being again filled with the loose soil taken out, and the plant being put in it, grew well for a while. So long as the roots did not exceed the bounds of the pit they did remarkably well; but whenever they extended beyond those bounds, they sought their way along the bottom of the top soil, refusing to enter into the poor subsoil. It followed that the young trees planted in this manner were, in the end, not one whit better than the others—the roots of both having eventually followed the same track; however, I observed that those planted in pits attained a greater size than those only notched in.

What I have said is applicable only to a thin upper soil, which is a frequent case—indeed, the greater part of the land at present termed *waste* in Aberdeenshire is of this thin nature—and it is in those parts that the young trees have failed. I have observed that, where the soil is of a depth beyond eight inches, we find no hardness on the top of the subsoil: and of this, I think, the proprietors are aware; because, until these few years, they have avoided planting upon the thin soil; and the wood having failed to grow upon it, they were put to a stand to know what to make of it. I will shew that that very land, bad as it is, will yet, if properly managed, grow excellent wood, and, very likely, crops of corn also.

In pointing out the method which ought to be adopted for growing wood upon the thin land which so much abounds in Aberdeenshire, we must first observe that thin land of this quality is not at all adapted for the growing of hard wood, the fir tree liking a free soil with a dry bottom. Hard wood, to grow

; to perfection, requires a strong soil, and where strong soils re met with in the north, they are more properly put under he plough than under wood; besides, fir wood gives most shelter, and this part of the country much requires it. To produce shelter, then, is our object. Spruce and Scots firs produce massy forest when grown up, and they are, therefore, the very objects which ought to be cultivated in a cold country like the orth of Scotland.

When I went to Aberdeenshire, I found pitting was in general ractice; because it had been seen that, whenever the top and ubsoils were mixed together, the young trees throve well, even n the thin land, as long as their roots did not exceed the bounds f the pit. Pitting answers well where the soil is of a proper epth and texture, but does not at all answer the purpose, as re have seen, upon thin soil. Of this, both proprietors and resters had become aware; for I observed that many of the proprietors had commenced trenching pieces of their thin land for oung forest trees, and this they did from the idea that, if the top nd subsoils were mixed together, the trees would thrive well. However, from the expense of trenching, very little had been done this way, nor was it necessary to pursue it; for the young trees put did not thrive according to expectation—and the reason is obvious. observed that, in trenching, they had thrown the top soil entirely ito the bottom: in short, the soil had exactly been turned upside own. Now, I would ask, how could young plants be expected grow amongst mere gravel—for so the subsoil was when turned p; had they mixed the soils, as I believe they intended to do, e experiment would, no doubt, have succeeded. I observed that renching of this sort had been attempted at Craigston previous my going there, upon which I saw trees which had been lanted three years not making one bit of young wood. I observed in several detached pieces of ground, where, from mere ccident, the top and subsoils had been properly mixed, the trees rew remarkably well; so much so as to excite the remark of trangers. I examined and found their superiority was occasioned by the soil in which they grew having been properly mixed nder them; but it had not been trenched. From the experience I gathered while in Aberdeenshire, relative to the growing f wood upon thin *waste land*, I feel perfectly confident in saying hat wood will thrive well in such land if the two soils are properly mixed together. As nature has pointed out the way, there s no use of trenching the ground in question for the purpose of heir being mixed; all that is necessary is to loosen it well with he pick; and I have found that the ground thus operated pon by the pick mixes much better than by trenching, and, at he same time, is done for a fourth part of the expense The top

soil is thin, and a strong man can with ease penetrate through it and turn up the subsoil, and mix it with the upper in the act of picking. The heath upon such soil being short, forms very littl obstruction, and, I think, should be allowed to remain loose o the surface, just as left by the workmen, to afford shelter to th young plants. Speaking from experience, I would say that a high-lying parts of such *waste land* ought to be thus prepared and then notch the young trees into the loose soil, pulling th heath up where it interferes with the young tree, but leaving a the rest for the purpose of shelter for the first year or two. would use seedlings one year transplanted, Scots and spru firs. By thus planting the high grounds, and, at convenient di tances, other portions to a considerable extent, all the land the neighbourhood would soon become sheltered and, cons quently, fit for agriculture. I have seen these bare lands grov ing fair crops of oats, while exposed to sweeping winds: wh would it not do if sheltered by woods? I need not answer th question, as it is evident to every one. I anticipate that su will yet be the state of matters in that part of the countr and it is for the purpose of encouraging that state of thin that I have thus presumed to give my opinion.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMAL AND THE MEANS BEST CALCULATED TO COUNTERACT THE RAVAGES.—No. XIV.

By James Duncan, M.W.S.

Of all the insects which are the cause of injury to the produ of our fields and gardens, the tribe of Moths, as has been alrea intimated, may be regarded as the most detrimental. It is t most extensive, assails us in the greatest variety of ways, a frequently in such a manner as to render it extremely diffic to adopt any effectual measure either of prevention or reme The eggs, in most cases, are not easily discovered, and, ev when found, are with difficulty destroyed. The same thing m be said of many of the caterpillars, the nature of whose hau and mode of life render them almost inaccessible, while t extreme prolificacy of the whole tribe enables them speedily repair any partial disaster. Instances of several different mod in which vegetables suffer from their attacks have already be given, and not a few remain to be added of an analogous ki as well as others of an entirely dissimilar nature. Of the

whose caterpillars are subterranean, and therefore root-eaters, we must not omit to mention the conspicuous genus of yellow-underwings, (*Triphæna*,) one of which is very common. It is—

The Great Yellow-underwing. (*Triphæna Pronuba.*) *Donovan's Brit. Ins.*, vol. ix., pl. 311.—The expansion of the wings is upwards of two inches; the upper pair brownish-gray, dark liver-coloured, or some shade intermediate between these two, each with two kidney-shaped marks towards the centre; under wings orange-yellow, with a narrow black band at the hinder extremity, but not reaching the margin, and continued along the anterior margin, emitting a narrow streak towards the centre of the wing; head and thorax of the same colour as the anterior wings, and the abdomen like the hinder wings. The eggs are, in all probability, laid in the earth; at all events the caterpillars penetrate into the soil, and pass the greater part of their lives beneath the surface. Their skin is tough and resisting, to fit them for such a mode of life; the colour brown, or dull-livid, with a slight tinge of green, and two interrupted black lines on the back. They pass the winter under the surface of the ground, and are capable of enduring a great degree of cold. Mr Curtis states that he has known them to be embedded in a sheet of ice and yet recover. They come to the surface early in spring, and prepare to undergo their metamorphosis to a chrysalis, which takes place in April, the moth appearing early in summer. It flies only for a short distance at a time, and chiefly in the afternoon and evening. During the day it may be found lurking at the sides of stones and among grass, and when an attempt is made to seize it, it seldom takes wing, but endeavours to escape by gliding rapidly away among the herbage. It appears to be plentiful in all parts of the country. The caterpillar seems to be a very general feeder, and destroys the roots of many kinds of useful plants. It has been known to commit extensive injury to the turnip crop by eating away the rootlets, and even penetrating into the bulb. Such methods of destroying it as have been previously recommended in the case of other root-eating grubs and caterpillars must be had recourse to.

The Pine-destroying Achatia. (*Achatia piniperda*, *Achatia spreta.*) *Curtis' Brit. Ent.*, vol. iii., pl. 117.—The tribe of pines and firs to which, in northern latitudes, we are so much indebted, alike for timber, shelter, and ornament, has a host of insect assailants, some of which belong to every division of the class. Not a few of these have been already adverted to, and there are several included in the family now under consideration, on which it is necessary to bestow a brief notice. The moth above named is by no means rare in this country; it is abundant and most destructive on the Continent, and it is therefore desirable that

fo esters and others having the charge of pine woods should have th means of recognising it. It is extremely probable that the great extension of fir plantations which has lately taken place in Scotland, particularly in the more northern counties, will be accompanied with a corresponding increase in the number of insects which make the foliage of these trees their food. Many of the most formidable kinds already exist in this country, and nothing but an equally extensive field of operations is required to render them as injurious as they are on the Continent, and that occasionally amounts to the total destruction of entire forests It is most desirable, therefore, that an effort should be made to keep them under at first; for if they are once allowed to increase to a great extent, it is difficult to reduce them within moderate limits, while their absolute extirpation becomes almost impossible

The wings of *A. piniperda* measure, when expanded, about an inch and one-third from tip to tip; the surface of the upper pair (which are rather long and narrow) reddish-brown, varied with yellow, and bearing two yellow stigmatic marks which are usually confluent; the external margin finely notched; under wings brown, with a rosy tint, and a red line close to the posterior margin: the under side of the wings is a pretty uniform ochreous yellow, with a reddish tinge, the upper wings with a dark-brown spot near the middle; head reddish-brown, thickly beset with hairs: antennæ whitish-brown; thorax brownish-red neck whitish; body rather short; abdomen grayish-brown.

According to Köllar, who has had many opportunities of observing the proceedings of this moth, the female lays her egg singly on the points of the needle-shaped leaves. They amount to from forty to sixty at each laying, and are of a pale-green colour. Contrary to what usually takes place in such cases, old trees, from sixty to a hundred years old, are preferred to young ones, which are never resorted to except where the former are not to be found. The caterpillar appears in about fourteen days it is at first smooth, very delicate, and of a pale-yellow, but undergoes modifications of colour at every successive change of skin, and, after the fourth moulting, longitudinal stripes become visible on the back. When full grown, it is about an inch and a half long, the head reddish-yellow, the body bright-green, with a white stripe along the back, and two others of the same colour on each side; there is also an indistinct orange stripe immediately over the feet, the latter brownish-yellow. The chrysalis which is pitch-brown or black, has two small points at the narrow extremity, and is enclosed in a web, and embedded among moss or loose leaves.

"The moth appears," says Köllar, "in April or May, if the weather be warm, (in this country seldom before June,) and si

day on the trunk of the tree, frequently pretty high up, and it ams about during the night in the pine forests. They remain the pupa state all winter. The caterpillar lives singly, eats ore by night than by day, and does not crawl along the trunk ke other caterpillars, but lets itself down by a thread, and does ot willingly ascend again. This insect is very tender and sen-ble of the changes of the weather, particularly of wet and cold, hich effectually check its usual increase." *

Bordered White Moth. (*Bupalus piniarius.*) *Donovan's Brit.* *s.*, vol. x., pl. 336.—This is another enemy of the fir tribe, eding on the common Scots and spruce fir. Although it has ot been observed so frequently in this country as the preceding pecies, it is well known to inhabit many of our pine woods, and one of the kinds against which we require to be on our guard. ts general history pretty much resembles that of *A. piniperda.* The eggs are laid on the foliage and terminal shoots; the cater-illars are hatched in four, five, or six weeks, according to the eather, and continue to grow and eat till late in the autumn, hen they change to a chrysalis, under the shelter of moss or aves on the ground. They are green in their earliest stages, ut ultimately varied with five longitudinal stripes, the dorsal ne white, the others white more or less tinged with yellow. When young, they merely break the outer skin of the leaves, but hen full grown consume the entire leaf, giving a preference to he foliage of young trees. They are not much given to locomo-ion, and when once they have stripped a district bare, such of hem as are not ready to undergo their metamorphosis perish, ithout attempting by change of place to find a further supply of od. Wet weather is more fatal to them than cold, for they do ot sustain any material injury when the temperature falls consi-erably below the freezing point.

Köllar states that this moth committed great ravages and ecame formidable in Bavaria, Saxony, and Pomerania, towards he end of last century, and a more recent instance of its depre-iations is thus recorded by Silbermann in the *Revue Entomolo-ique*:—"At the end of 1832, a malady occurred among the ir trees in the forest of Hagenau, one of very considerable extent ear Strasburg, extending over 7000 hectares. The firs cover-ng a space of about 40 hectares were observed to have the leaves f a yellow colour and of a dead appearance. The cause of the nalady was at first sought for in vain; but, during the following ear, it was so much increased, that more minute researches were nade, and it was at length discovered that it was owing to the ttacks of the larva of the *Bupalus* which commenced its ravages

* "Treatise on Insects Injurious to Gardeners, Foresters, and Farmers." oudon's Trans. p. 335.

at the beginning of the month of May, passing from tree to tree until the month of October, when it descends to the ground to undergo its chrysalis state. The hundred acres attacked in 1833 are now entirely destroyed without hope of future vegetation."

The moth commonly makes its appearance in this country in June; the sexes are somewhat dissimilar, and might readily be mistaken for distinct species. The male is smallest, the wings expanding about an inch and a-half, and the body being about six lines long and very slender. Antennæ deeply pectinated and brownish-black; upper wings dark-brown, with a dull yellowish-white triangular spot on each, extending from the base nearly to the centre; under wings yellowish-white, covered with dark-brown dots, and crossed posteriorly by two bands; under-side clouded, with two brown bands on the hinder wings. The female is larger; the antennæ simple and thread-like; the ground-colour of the wings rusty-yellow, with two light-brown cross stripes; under wings similar to those of the male, but the markings imperfect and indistinct. When the insect is at rest, the wings are directed upwards, in the same manner as in butterflies.

This is the first moth we have had occasion to notice which belongs to the great tribe of geometers or loopers. Although often difficult to distinguish among themselves, their caterpillars are, therefore, at all times easily distinguished from those of other races. Six conical pointed feet always exist on the pectoral segments, or anterior part of the body, and one or more pairs on the hinder extremity of the body, the intermediate or abdominal segments being entirely destitute of feet. In consequence of this arrangement, the caterpillar is unable to advance with a proper and continuous reptant motion, and has therefore recourse to another mode of progression. It fixes the body to the plane of position by the hinder feet, and stretches itself forward to the full extent; then, laying hold with the anterior feet, the tail is left free, and drawn towards the head till it comes up to the anterior feet, the intermediate portion of the body being, by this process, bent upwards into a loop or arch. Every progressive movement is effected by a repetition of the same manœuvre, and the space is thus traversed by a series of regular and measured steps, each of which is nearly equal to the length of the insect's body. These peculiar attitudes have suggested the names above referred to.

Mottled Umbre Moth. (*Lampetia defoliaria.*) *Phal. Geom. defoliaria, Linn. Harris' Aurelian*, pl. 14, fig. *n–r.*—This is a more common moth throughout the country than either of the two preceding species, and may be said to be a general feeder, not only infesting forest trees, such as oak, beech, and especi-

ally the lime, but also not unfrequently attacking fruit-trees. It seldom appears in the winged state before the end of October or beginning of November, when the first care of the female is to find out a tree fit for receiving her eggs. These are about 200 in number. The caterpillar, which is a geometer with two pair of feet near the hinder extremity of the body, is of a rust-brown colour when full grown, with a bright-yellow stripe on each side, and a red spot with a white dot on each segment, marks by which it is very easily recognised. They are solitary feeders, and scatter themselves over the whole tree, consuming the foliage with great rapidity. The chrysalis is reddish-brown, very acute at the tip. The wings of the male expand about one inch seven-twelfths to three-fourths; the upper pair, which are broad and ample, grayish-white or rusty-brown, sprinkled with blackish specks, and crossed by two dusky undulating lines, one not far from the base, the other a little beyond the middle, the centre of the wing with a dark spot; under wings dull-white sprinkled with brown specks, and having a brown central spot. The female is entirely destitute of wings, these organs not existing even in the most rudimentary state. The body is of a grayish-white colour, sprinkled with black streaks and specks, and the feet are ringed with yellow and black.

The Winter Moth. (*Cheimatobia brumata.*) *Phal. Geom. brumata, Linn.*—The history of this moth, the most formidable pest to fruit-trees of all the geometrine species, has been carefully investigated by the Canon Schmidberger, from whose account several of the following particulars have been derived. It is named the winter moth on account of its appearing so late in the season, seldom before the end of November or beginning of December. The female is apterous, and frequents the stems of the trees when pairing takes place, after which she ascends to the uppermost branches to oviposit, laying her eggs, one by one, either at the roots of the leaves or on the branches, sometimes on the fruit and even on the leaves. They are very numerous, often upwards of 200, of a green colour, and so small as to be detected with great difficulty. Firmly glued to the bark, and covered with a secretion which hardens over them like a coating of varnish, they not only repel the moisture, but bear without injury the cold of the severest winters. The heat of spring necessary to cause the buds to expand is just that degree of temperature requisite for hatching the eggs; and the appearance of the caterpillars and their food is thus exactly contemporaneous, and that whether the season be early or late. They are at first extremely delicate and semi-transparent, requiring but little food, and sheltering themselves alike from the cold of

the night and the heat of mid-day beneath a fine web, wov within the leaves of the calyx and the opening blossom. Th begin to gnaw the petals as soon as they are unfolded, a likewise perforate the leaf-buds, continuing at intervals to wea a thin web which draws the parts together and prevents the expansion. "When the blossoms begin to unfold," says Schmi berger, "some of these caterpillars hang themselves in the peta and others descend to the receptacle to find food and shelt while those which can get no blossoms penetrate and ma their way into the centre of the unfolding leaf-buds, and ta up their abode there. When the fruit is formed, it is th favourite food, and they eat it almost entirely, so that only t stalk or part of the core remains. They then return to t leaves, eating at first the more tender ones, then, as their bod become stronger, the remaining leaves, particularly when t insects are very numerous. As these caterpillars destroy th houses by their voracity, they are obliged, in order to make fre ones, to have recourse to the withered skeletons and sta of the leaves they have eaten. They glue these together the shape of a ball, and seek protection from rain and c within. There they devour the remainder of the buds, which extremely injurious to the tree, as, by doing so, they complet destroy the spring shoots. These small balls or masses on t leaves and shoots give them the appearance of having be scorched; and nothing green is now to be seen on the tree. T caterpillars therefore leave it and take possession of anothe The colour of the caterpillar is pale-green, with faint lines the sides.

When they are fully matured, which is about the end of M or beginning of June, they allow themselves to drop from t tree by the aid of a silken thread, and become chrysalides in t earth. The moths are not all disclosed during the same season, su as were late in becoming pupæ, continuing throughout the win in that state, and appearing in spring. The upper wings of t male expand somewhat more than an inch, and are of an as brown colour, with various indistinct darker waved streaks, for ing in the middle a faint transverse band; the hinder mar with a series of dusky spots at the base of the fringe; hind wings pale, with faint dusky bars, which are occasionally obsole The body is very slender and delicate, of a yellowish-gray colo That of the female is considerably more robust, and ash-gr the wings rudimentary—that is to say, only a portion of t base existing, which is of the same colour of the body, a crossed about the middle by a dusky streak; feet long.

The natural enemies of the caterpillars of these moths are ve

numerous, and it is, no doubt, owing to their operations that our orchards in general suffer less than might be expected. About the time the caterpillars appear, most of the small birds have families of young to support, and to these the *green loopers* afford a favourite morsel. Titmice especially search for them with great assiduity, and destroy them in multitudes. The chrysalides are seldom deeply embedded in the soil, and are not unfrequently merely covered with a clod of earth; they are frequently, therefore, destroyed by long-continued wet weather and the severity of the storms of winter. Owing to the lateness of the season, also, when the moths emerge from their pupal retreat, they are frequently overtaken by frost and snow in the very act of making their escape, and being thus unable to reach the surface of the earth, necessarily perish. Parasitical insects likewise of various kinds assist in their destruction; and it is asserted that ants have been often seen hurrying down the stems of the trees, one after another, each with a caterpillar in its mouth.

The circumstance of the female of this and the moth last noticed being destitute of wings, has suggested a method of guarding the fruit-trees against their depredations, which is well worthy of attention. It is simply to surround the stem of the tree with something which shall prevent them creeping up, the only way by which they can get access to the fruit-bearing branches. Some glutinous and tenacious substance would seem to answer this purpose best; and, of all that have been suggested, bird-lime promises to be the most efficacious. It is not speedily dried by exposure to the air, but retains its viscosity for a time without requiring to be renewed; and it is sufficiently tenacious not only to arrest the progress of the insect, but retain it altogether till it perish. A thin layer or belt round the trunk of the tree, not far from the ground, would be an effectual barrier not only against this insect in particular, but likewise against several others. In regard to wall-trees and others similarly circumstanced, it would obviously be necessary to continue the layer of bird-lime along the wall, as the moth would otherwise find ready access to the branches at any other place, if prevented ascending the stem. Tar, grease, and other substances of a like nature, have been tried for the same purpose, and they are not ineffectual; but the objection to them is, that they quickly dry up, and require daily renewal. The tar, also, has been found injurious to the tree, particularly if young, as it penetrates through the bark into the wood, and interferes with the circulation of the sap. To remedy this evil, Schmidberger describes a contrivance which he calls a boot, and which he asserts has been found completely to answer the end in view. It consists in surrounding the base of the stem with a

wooden frame or box, and daubing it on the outside with the ta instead of applying it directly to the stem. The frame consis of four boards about a foot high, and ought to be rather longer th the diameter of the tree they are to surround. These four boar are to be nailed together in the form of a square open box; b the fourth board is not to be fastened on till the frame is plac round the tree, as the stem must be entirely enclosed by t boards. To prevent the sun or rain from having any effect the tar or cart-grease, the top of the frame is to be surround with a moulding; that is, a thin piece of wood, three or fc inches broad, is to be nailed on the top, so as to form a projecti on the outside, and under this an angle. This angle, formed the outside only, is to be thickly smeared with tar. This fra must be set an inch deep in the earth, which should be well tr den in round it, so that the moths may not get under it and rea the tree. It should be brought into use before the time wh moths begin to ascend the trees. It may be necessary to da it two or three times at first with the tar, as the latter is par absorbed by the wood for a time; but afterwards two or thr smearings will suffice for the remainder of the autumn, and, as additional precaution, it may be renewed in the spring. Cat pillars cannot pass this *cordon sanitaire*, and it will likewise arr the progress of many noxious beetles which do not use th wings. If this boot, or a layer of bird-lime, be not resorted t nothing remains but to uncaterpillar the tree in the usual wa after the ravages of the caterpillars begin to appear, and when considerable portion of the mischief has been already co mitted.

Currant or Magpie Moth. (*Abraxas grossulariata.*) *Donova Brit. Ins.*, vol. i. pl. 4. *Harris' Aurelian*, pl. 12, *fig. f f-h.* This prettily marked moth is very common in gardens throug out the country, and the caterpillar is often associated with th of the saw-fly of the gooseberry, in defoliating our currant a gooseberry bushes. In some seasons it is very plentiful, and the caterpillar is voracious, the injury it commits is very consid able. The size of the moth, and its bright colours, render it very conspicuous object, and it is probably well known to eve one interested in the preservation of garden produce. Its strong contrasted hues have procured for it the name of magpie-mo and it presents a peculiarity seldom witnessed among insec namely, a similarity of colours in all the different stages caterpillar, chrysalis, and moth. The upper wings, which me sure from an inch and a-third to two inches from tip tip, are white, with two bright yellow bands, one at the ba each wing, the other a little beyond the middle, and six tra

verse rows of rounded black spots, the first consisting of a single spot or two at the base, the third irregular and interrupted, the fourth and fifth enclosing the outermost of the yellow bands, and the sixth on the exterior margin; all these spots vary much in size and position, and some of them are generally more or less confluent. The under wings have a few scattered black spots on the disc, and a regular series of larger size round the posterior border. The body is yellow, with rows of black spots; the head and antennæ of the latter colour. It is liable to great variation in the marks, and occasionally the black spots are so large as to occupy nearly the whole of the surface.

The eggs are left to brave the severity of the winter, and the larvæ make their appearance as soon as their appropriate food can be obtained. Frequently also the caterpillars survive the winter in a torpid condition, without requiring food, and revivify with the first warmth of spring. Although their proper food is the leaves of the different species of *Ribes*, they occasionally attack the blackthorn and some other trees. The ground colour of the body is bluish-white, the back with numerous black spots

of various dimensions; the lower parts of the sides and th yellow, sprinkled with black dots. They have ten feet, which, placed upon the pectoral segments, are scaly and the other four fleshy, one pair situate near the hinder par abdomen, the others at the extremity.

The chrysalis of the gooseberry moth is pitch-black, w low bands on the segments. It is generally suspended branch of the bush on which the caterpillar fed, and is pe liable to be attacked by parasitical ichneumons. I have o several different species of ichneumons from the chrysalid multitudes are, no doubt, annually destroyed in this way caterpillars, being pretty large, and their colours cont strongly with the green leaves and dark-coloured bark bushes, they are easily observed, and may be picked off v hand. The flight of the moth is slow and heavy, and it caught without the least difficulty.

Pea-green Moth. (*Tortrix viridana.*) *Phalæna Torti dana*, *Linn.* *Donovan's Brit. Ins.* vol. iv. pl. 144.—This sn pretty insect has been long known as one of the most some of the numerous insect enemies of the oak, and it i attract attention from the curious manner in which the i occasioned. It belongs to a tribe of small moths named *cidæ*, from the larvæ being in the habit of twisting or ro leaves into a cylindrical tube, in order to form an abode fc selves. Not a few of them are injurious to different kinds and fruits; and they may be known, when at rest, by the liar form, the anterior wings being very broad near the b humeral angle forming a wide curve. Towards the mid are somewhat contracted, and again dilated at the hinde mity; the whole figure of the outline thus bearing som blance to that of a bell. This peculiarity of form has them to be frequently termed *Broad-shouldered Moths.* ' sent species measures about nine lines and a-half across th the upper pair of a uniform pea-green, the under wings the fringe white, slightly tinged with green. The cate also green; it has sixteen legs, and is a good deal narr the hinder extremity. Its first care, after being hatched ing acquired some degree of strength, is to form a dwel itself, under shelter of which it may feed and find protecti the weather. In the performance of this task it exercise derful degree of ingenuity, and produces a structure wh fectly answers its end, but which, on examination, we sho pose to be beyond its power to accomplish. The oak lea of considerable strength and elasticity, the fibres and offering much resistance; yet this small caterpillar, by

ed efforts, succeeds in rolling them up into a hollow cylinder. e commencing its operations, it seems to take a survey of af, in order to discover the part best adapted to its purpose. ailing itself of some natural inflection or curvature, such as enerally be found even in the flattest leaves, its labour is imes much lessened. It then takes up its position nearly y between the terminal edge of the leaf and the place to it desires to draw it, the latter being generally the mid-rib, ne one of the principal nervures, and spins a multitude eads between these two points. These threads are the nical means by which the operation is to be accomplished. urvature once formed, they easily prevent the recoil of the ut it is not so obvious in what manner they cause it to roll Reaumur, one of the most philosophical observers that ever igated this branch of natural history, was unable to satisfy f how the effect was produced, although the operation was on under his eyes. It is very likely that the threads underne contraction as the moisture evaporates by the action of r, and, however slight the contraction may be, it co-operates other causes to produce the curvature. The only other which the insect has been observed to employ, are drawing reads towards itself by its forelegs, and hanging upon them he whole weight of its body. These threads are not placed dom, but arranged in small bundles or fascicles, each of consists of two parallel rows, crossing each other in the . When the insect has formed the lower series, it passes other side and spins the second, making use of the former so doing, as a kind of platform for the support of its body. ole weight, consequently, tends to draw the leaf forwards, every successive thread of the upper set that is fixed imme- secures the additional curve gained by the continued re. The effect of this mode of proceeding soon becomes in the appearance of the threads; the lower ones become nd floating, and those last spun alone continue tight. One ution of the leaf being in this way secured, the laborious orkman proceeds to form a second, by fixing his cords back on the bent part of the leaf, and managing them as When the last roll is completed, the whole is secured eries of silken bands, one or two of which are placed at each ity of the cylinder. The caterpillar now takes up its abode interior, and finds ample means of subsistence in the inter- ers of its dwelling, without injuring the outermost roll; or atter is likewise consumed, it is under the necessity of con- ng another tenement.

moth appears in July, and is usually very abundant in oak es and woods of fullgrown oak trees. Its depredations in

this country have been long noticed. White of Selborne refe to it under the name of *Phalæna Quercus*, and says, " Many our oaks are naked of leaves, and even the half, in general, ha been ravaged by the caterpillar of a small phalæna, which is of pale yellow colour. These insects, though of a feeble race, ye from their infinite number, are of wonderful effect, being able t destroy the foliage of whole forests and districts. In a field nea Greatham, I saw a flight of swifts busied in catching their pre near the ground, and found they were hunting after these phalæna Sir Wm. Jardine, in a note on the above passage, states that, i the summer of 1828, and again in that of 1829, he met wit this species in immense profusion about Inverary and near Loc Katrine, where many hundred acres of oak copse appeared, as i early spring, with the leaves much destroyed by this insect. is stated, in Loudon's Arboretum, that the caterpillars were numerous in Kensington Gardens, in May and June, 1832, th the excrementitious matter from them kept falling and tricklin on the grass below, so frequently as to give the idea of a sprinl ling of rain being then falling. From what we have ourselv observed, and from the communications received, we believe tl moth to be very abundant in all parts of the country, and in son seasons to increase to such an extent as to check materially tl growth of the young oak tree, and, at the same time, render the very unsightly. Some of the methods formerly recommended f destroying tree caterpillers may perhaps be employed with son advantage ; but owing to the caterpillars, in this instance, livi in a well-constructed retreat, it is very difficult to get at the and that difficulty is often increased by the height and size of tl trees. Our oak woods, too, are so extensive, that catching t moths with a net cannot be practised but in such a way as wou make but a very small reduction in their numbers.

Small Ermine Moth. (*Yponomeuta padella.*) *Phal. Tin padella, Linn. Phal. Evonymella, Donov. Brit. Ins.*, vol. i. p. pl. 9.—The ermine moths, of which there are a consideral number of species in this country, are so called on account their beautiful white colour, which is frequently varied with sm black spots. They are of small size, the body narrow and sle der, and the wings, when at rest, closely applied to the body, a meeting above in such a manner as to form a kind of roof ov it. The caterpillars are very injurious to hawthorn hedg apple-trees, the sloe-thorn, and some other trees, collecting t leaves into bundles, and covering them with a tenacious web they have entirely consumed them. One of the most comm and destructive is that named above, of which, accordingly, proceed to give an account. It is probable that the proceedin the rest are nearly the same, but they have not hitherto be

amined with the same attention. *Y. padella* (so named from e bird-cherry, *Prunus padus*, on which it sometimes feeds) is out five lines long, exclusive of the antennæ, the upper wings ually white, slightly tinged with a leaden colour, and marked th a considerable number of small round black spots, having a idency to run into longitudinal rows, except towards the tip of wing, where they shew a tendency to run transversely; fringe the anterior wings livid; hinder wings of a uniform leaden our, the fringe rather paler. Such is generally the colour of s moth, but it is subject to great variations, especially in the t of the anterior wings, which are often more or less clouded h a livid colour, and the number of spots, usually about thirty,) varies.

The female lays her eggs, amounting to twenty or thirty, in a ss, commonly in the month of July, and they are for the most t placed near a blossom-bud, if on a fruit-tree, or near a leaf l. They are then coated over with a gummy matter, which umes the form of a scale when dry, and in two or three iths the caterpillars are hatched under this scale-like cover- . Whether they derive any nourishment from the sap of the nch on which they are placed, it is not easy to say. Soon r being hatched, it is probable they become dormant; at all nts they pass the winter without making any attempt to irge their residence. They make their escape from this hyber- ulum in spring, as soon as the leaves begin to expand; but ig still too delicate to expose themselves to the severities of weather, they mine into the substance of leaves, feeding on cellular tissue, and leaving the epidermis as a protection on er side. Having remained in this retreat sufficiently long to uire size and vigour, they emerge into the open air, and mble in small colonies on the surface of the leaves. Here fabricate a loose web composed of threads, for the most part gular, but having a frequent tendency to run in a longitudinal ction, under which, as in a common tent, they continue to till they acquire their full size. The web is, of course, wed as often as they require to shift their situation for a new ly of food—a circumstance which happens often; for they ely eat the pulpy matter on the upper side of the leaves. A which has for some time supported a number of these detach- ts of caterpillars, presents the appearance of having been ched, the leaves being crisped up and their verdure totally hilated, while the twigs are impeded in their growth and ted together by the enveloping webs. The caterpillar is of shy-white colour, with a brown head, and a few small black s on each segment. It has sixteen feet, and the body is oth, excepting that a short hair springs from the centre of

each of the black wart-like tubercles. When the pupa state is about to be entered upon, the caterpillars do not break up their association and depart each to his own solitary retreat, as happens with the greater number of these creatures. They form their cocoons under shelter of the same tent which protected them when feeding, and they are arranged side by side. They are of a cylindrical form, tending to oval, of a leathery consistence, and composed of white silk. The chrysalis resembles others of its tribe, and is without any little transverse hooks at the extremities of the segments, as may be noticed in those of several of the smaller moths. The moth is ready to make its escape from the chrysalis in about twenty days, and its exit is attended with this peculiarity, that the chrysalis is not forced out of the cocoon, which it seems unable to accomplish, owing to the tough elastic nature of the substance composing it, and the want of abdominal spines to serve as points of support.

Such is the history of this insect's changes and developements as they have been observed in this country, particularly by Mr Lewis, whose account appeared in the Transactions of the Entomological Society. It would seem that, in some parts of the Continent, and particularly in the neighbourhood of Vienna, probably owing to the difference of climate, the caterpillars are hatched the same season in which the eggs are laid, and they pass the winter in the caterpillar state under a joint web formed to protect them from the cold. We are not aware that they have been observed to do this in Britain. The moth is very common in some parts of this country, and every year we hear accounts of its depredations. Last summer, as we are informed by our esteemed correspondent, Mr Wighton of Cossey Hall Gardens, it abounded in that neighbourhood, and not a few instances of its ravages fell under our own notice in Scotland. In France it is sometimes most pernicious. "At the commencement of the month of July last," says Mr Westwood, "I observed this devastation carried to a lamentable extent in the apple-trees with which the road-sides between Abbeville and Paris are planted, and which for miles were completely defoliated. The branches were covered with webs, and not the least portion of green was seen; the webs were suspended from the branches in festoons reaching to the ground, which, beneath the tree, appeared to be carpeted with silk, in so remarkable a manner as to attract the attention of the most incurious passenger. Some kinds of apples, however, as well as the pear-trees, escaped. It appeared indeed surprising that certain trees should be untouched, while the rest were so completely destroyed that it was doubtful whether they would have strength to throw out fresh shoots. This [illegible], however, depending on the nice discrimination in the

f the insects, might be beneficially employed, by inducing ig of those varieties which appear to be most unpalateable se destructive creatures." *

same methods of destruction must be had recourse to as case of other web-weaving caterpillars, the operation being ted by the knowledge of the insect's history as given above. ajor affirms that they can be destroyed simply by the appli- of strong soap-suds discharged forcibly from the engine, o break the webs and drench the insects. Mr Lewis sug- that the leaves should be gathered and destroyed while the illars are young and in their mining state; but they would lifficult detection, and the process is far too laborious to be taken to any extent. On the Continent, numbers are yed by a small ichneumon, about two lines long, with a head, thorax, and abdomen, and reddish antennæ and feet, is conjectured to be the *Ichneumon rubellus* of Gravenhorst.

THE TAMWORTH AND LIVERPOOL SPEECHES.

many occasions, ere the Quarterly Journal of Agriculture ts present shape, we laid our opinions on the state of the aws before our readers, not without a strong feeling of the icy and difficulty of the subject, and not without severe ation of the silly or designing people who, equally ignorant t or any other subject which is comprehensive in its bear- make it a stalking-horse for the furtherance of ulterior During the currency of the last year, the discussion d on orally, or through the press, has been suffered to lose ig, either in frequency or virulence of debate; and seeing we have seen in our day, as to how many things have been led, not because they were proper, but to be quit of vexa- importunity and complaint, not a few who considered the s of the Anti-Corn-Law League as Quixotic and Utopian, atterly been awakened into something like a reality of fear, the interests of the landholders and farmers might ulti- y be subjected to undue and disproportionate oppression.

r these reasons, the mind of Sir Robert Peel on the subject thing particularly to be desired—all kinds of absurdities his designs having been broached, and each class shaping he what-should-be into the what-would-be. The Lichfield h has happily laid the ghost of all these speculations; and

* Loudon's Gardeners' Mag. vol, xiii. p. 434.

the address delivered at the first great meeting of the Tamworth Farmers' Club, of which the Premier is chairman, is well worthy of serious and attentive consideration. With a strong feeling of approval for the objects intended to be promoted by the formation of such societies, he commenced by calling upon his hearers to remember that, by the rules of their club, all topics having any tendency to create political discussion, or awaken party hostility, must be studiously avoided, and that it was essential to its success that all members should meet on neutral ground in reference to these extraneous subjects. The sole design of their associating together was to be the improvement of the country, by judicious improvements in agriculture and the application of science to the cultivation of the soil, so as to increase its productiveness. He hoped, therefore, that all their speeches would be of a practical character. He indeed reminded them that they were not a club even for the protection of agriculture, nor had anything to do with the great question, relating to it, which now agitated the public mind, but a club for the promotion of agriculture as a science: in short, what they sought after was to find out how, in the shortest time, at the least possible expense, they could produce the greatest quantity of food, whether vegetable or animal, for the use of man, and that without permanent injury to the soil.

The hints of Sir Robert Peel, regarding agricultural improvement, are quite worthy of the occasion which called them forth, and are characterised by discrimination and shrewd sense. The art is a practical one, and nothing is of such primary importance to success as a minute and unwearied attention to details. Skill can therefore only be obtained by experience, by extended observation, and the perusal of treatises, and by the comparison of facts by conversations for mutual instruction. With regard to mere personal experience, Sir Robert justly observed—

Gentlemen, I should be the last man to undervalue practical experience. If it is founded upon very extensive observations, it is of the utmost value; but, depend upon it, the *British farmer is exposed to a competition which will make the mere reliance upon a limited practical experience a very imperfect resource.* (Hear.) If a man's experience be confined to his own district—if he has no opportunity of comparing his method of agriculture with the method of other districts of the country—if he takes it for granted that because he has been for forty or fifty years employed as a farmer—if he takes it for granted that if he pursues the method followed by his father before him he will therefore prosper—and if he believes that practical experience is all that is necessary to ensure success · depend upon it he will be disappointed. It is impossible for any one to travel ten miles through the country—it is impossible for a man to go out of his own parish—without seeing that the mere reliance upon personal experience will not ensure success. You see different degrees of fertility upon lands of equal natural strength-- you see the land cultivated by a farmer having merely the advantages of personal experience, and that of another introducing improved methods of cultivation, producing the greatest difference in the results—where one brings to bear the advantages of chemical and geological science, while the other brings only the result of his own practical experience and personal observation.

was also another symptom betokening good to the com- that had become pleasingly observable during the last 's, which was the increased interest so many landholders ibited for the improvement of their estates, and their orward, hand in hand with their tenantry, for that purpose. In looking round him, Sir R. Peel observed saw many landlords, as well as many farmers, and many ited both capacities. Some of the former might know emselves practically of agriculture, but it was in the of every one of them to do more or less to promote it. anced himself.

landlord, but I cannot say that I am a practical farmer deriving profit from ation of the soil. Still I hold land, and it becomes me, and other land- have not the means of affording information to their tenants from their ssful pursuit of agriculture—it behoves us to consider in what way we can to the advancement of agriculture. Although we know little about it, in these agricultural districts, and coming frequently into communication armers, my opinion is, that the landlords may greatly contribute to the and advancement of agriculture. Take for instance the breeding and ent of stock. Gentlemen, I speak for myself when I say that improve- ins at home. (Hear, hear.) The relation of landlord and tenant is de- well understood; and, speaking with reference to my own tenantry, I wish whole district prosperous, but I naturally wish, in the first instance, to n tenants prosperous. I state here, in the presence of many of my own hat I am willing to do everything I can for the improvement of their stock, and if a committee of the most intelligent of them will go to Birming- great metropolis of this part of the country—if they will go and ascertain e best description of stock, and what is in the greatest demand—if they will what description of stock derives the greatest improvement in point of or the greatest quantity of milk from being fed upon the pastures of this I will, regardless of the expense, introduce the best animals—the best nstance—and will give the opportunity to my tenants to improve the breed estate. Gentlemen, that is one mode in which I—although little convers- griculture, but as a landlord deeply interested in the promotion of its pro- can contribute to the advancement of those in whose prosperity I am inte-

ı regard to another great source of agricultural improve- -manures—Sir Robert makes the following very sensible tions. He expressed his consciousness of many farmers ewildered by the varying and opposite accounts they had of the results of the same substances in fertilizing the soil; ne even doubted that interested motives might not seldom ed to the exaggerations regarding some of these, some- uffed off to the public as truths. At all events, he was that sufficient data were yet awanting as to the applica- f most of them to particular soils. The interest of land- n this matter Sir Robert alludes to in the following :—

re landlords, although knowing little of agriculture, have the opportunity ting our tenants by taking the course which I am prepared to take, namely, experiments and exhibit the results. Let us take this artificial manure, ur tenants state their doubts on the subject; but if the landlord will go to

the expense of devoting a portion of his farm to the experiment, if he will the manure, and apply it with perfect fairness, and exhibit the result to his then they will have a greater confidence in determining whether they will expense of purchasing it, and they will have greater confidence in the res application. (Cheers.) You remember, gentlemen, that I set out by that practical observations were more important than elaborate speeche follow up this remark I shall state to you that I desired a friend of min knew had carefully made experiments with a manure which has been lat duced, and the merits of which you must all be in some degree familia mean guano—I desired him to make the experiments with care and fairnes communicate results to me. It was as follows:—"On a field of two acres with potatoes, the result of manuring the ground with guano, Potter's ma stable manure, was as follows:—Guano, 15 bushels; Potter's manure, 11 and stable manure, 9 bushels. The ridges in which the potatoes were gr of the same length; the potatoes were of the same quality; and the produ several ridges having been taken up and measured, the average result was tl stated." The following details will make the information more complete guano and Potter's manure (which is made in London) were each mixed w ashes and fine mould in the proportion of one bushel of guano, or Potter's to six bushels of ashes, &c. A bushel of guano weighs about 85 lb.* Thre of guano and three bushels of Potter's manure, making 510 lb., were pu ridges at two different times, being at the rate of 3 cwt. per acre, each manures costing 14s. per cwt. Half of each was put into the ridges when toes were planted and the other half when the potatoes were appearing abo out of the ground, covering in the guano and Potter, by hoeing and ra ridges. The potatoes were planted the 4th of April, and taken up early in The produce exceeded 600 bushels, the field having been previously exhau in very bad order. The total expense, including every charge, was £16, a a bushel, the profit on the two acres was £14. The value of the land was per acre if let. I tried the Potter and guano manures in grass upland. there was no manure the produce was nearly double, and an increase of ab third as compared with stable manure, which was put on the land late. grass land the guano and Potter's manure were nearly equal in their effec trial was not so satisfactory, as the stable manure had been put on too late 14s. a cwt. for each of these artificial manures. The price I understand is a cwt." Now, that was the result of the experiments, and I believe they w with perfect fairness. At the same time I don't blame you, who have he stable manure will produce similar results. I cannot ask you to go to this but I am prepared to do it, and I shall be ready to devote a portion of my the experiment, under the superintendence of a committee—to have the taken out at the proper season, and to test the result. (Hear, hear.) So respect to the other descriptions of manure; and if the landlord will devo tion of the land he holds to different experiments—say, six half-acres—in t pointed out by his tenants, that is a mode in which the landlord, although tically acquainted with agriculture, may, in my opinion, render important

While on the subject of manures, although in interrup the other topics of Sir Robert Peel's speech, to which we recur, we give here the admirable sentiments of Professor low at the Saffron Walden Agricultural Society. Their and shrewd common sense must recommend them to the standings of all.

The name of an "experiment" (said the Professor) is apt to frighten some because they are often conducted on too expensive a scale. A gentleman to spoke to a friend of his upon the subject of trying my experiment as to the

* This surely must be a typographical error, for guano only weighs 64 bushel.—Edit[illegible]

xing ammonia in dunghills—a simple matter—and he said, "Are you trying this xperiment?" The other said, "No, nor will I on any account; I tried gypsum, and t cost me a great deal, and, depend on it, it is all nonsense; I have no doubt it will urn out an expensive matter before you have done with it." To this the reply was, "It cost me 9d.; where is the harm of that?" Experiments of this kind are not likely to be made of use to the farmers; because science cannot progress without the assistance of the farmers; unless they will unite with us in trying these things. Of course this experiment I have alluded to has as yet no results; but it is in progress, and, when these results come in, it will be my duty to put them into shape, and see whether they are useful to the farmers or not. But I will quote the result of an experiment from a friend of mine, not to prove to you that these things are really useful—because I call on you by fifties to try them, as that is the only way it can be satisfactorily decided—but this may shew you there is something in it worth attention. A friend of mine tried to fix ammonia in liquid manure, and I will simply state that, from that experiment, he arrives at this conclusion:—A patch of land without manure produced nine coombs of barley per acre; another portion of the same land, of similar dimensions, manured with liquid manure, produced ten coombs; and a third portion of the same, manured with liquid manure in which the ammonia had been fixed by a little sulphuric acid, was increased four coombs an acre. You may say there is a mistake in it; I do not say there is not, but I think it shews you that you ought to try these experiments by fifties and thirties together. This is the point on which I am trying to connect the whole agricultural body; and this is the only way in which we, as scientific men, can pretend to look at your interests, for we have nothing to do with them. I have not a foot of land on which to try these experiments. You have attained to great perfection in the art of agriculture, and scientific experience tells you the reasons of it. With men who had no knowledge of the laws of vegetation, one would give you one reason and another another, but scientific men will all agree; and we shall arrive at a beneficial result if you will co-operate upon it. This morning, as I was looking at what was done in the field, I was struck with this point—it is a point with you that the land should be drained, and the botanist will say there is great reason why it should; there are some plants that require to be in stagnant water, and there are others that would die in it; therefore, for this latter class, you get rid of all the stagnant water. But one question would be this—whether by this continual draining you do not carry away some of the salts distributed minutely through the land, and which are essential to these plants. Therefore, in a course of years, whatever mechanical benefit the land may derive from draining, that may to a certain extent be counteracted by the loss of some chemical benefit which the salts bestow upon the land; and you must restore to the land what draining deprives it of. Therefore, on all lands where you can, you may beneficially force up this water to a high level, so as to combine with the system of drainage a system of irrigation; for there is no doubt that is the system of nature. The system of drainage deprives the land of useless or hurtful water; but, you know, there are times and seasons when you would be glad to return it through the drains again; and, wherever the opportunity occurs, I think there is no doubt that the combination of a system of irrigation with a system of drainage would be like the system of the circulation of the blood discovered by Harvey. It will be said that it is impossible to do so; it may ho so ninety-nine times out of a hundred, but where it can be it should be tried, and on lands where it could be practised, it would produce an increase of crop. But these are matters of practice, to be judged of by practical men: all scientific men can do is to offer these suggestions for your consideration, and you are to decide on their practicability; for if I told you that gold dust was the best manure for your land, you would not try it if you found that you lost more than you could gain by the operation. I hope it will be understood by the farmers that I do not dictate to them, but I merely advise them, and, on the authority of chemists, I tell them that, in a few years, the art of agriculture will be improved to a great extent, and more than it could be by one man trying results in a separate manner, if you would try experiments collectively; for it would take years for one person to arrive at the same result that could be arrived at at once if tried by fifty.

We must return to the Tamworth speech, and the observa-

tion of Sir Robert on its two remaining principal topics—leases and game—and first of the former.

On a late occasion, in a neighbouring city, (Lichfield,) I took the opportunity, in speaking on the subject of leases, to observe that the habit of the country was adverse to the practice of granting leases; but that if any tenants of mine felt that their position would be raised and their confidence in the security of their tenure would be increased by it, and were to apply to me for an extension of the term now granted as an additional security for the outlay and application of their capital, that I would be disposed to give a favourable consideration to such an application. I make the same declaration now in the presence of many who occupy land from me —and that is not an empty declaration; because, in the only application made to me, I have granted a lease. (Hear, hear.) The land was out of order, and the application was made to me by a new tenant, who contemplated improvements, and had capital to expend, which I think every landlord has a right to require. He said, "I am a stranger to you, and with every confidence in your declaration, I would rather have a lease." I granted him a lease for nineteen years—the first seven at a reduced rent, and the remaining twelve at the rent paid by the former tenant. That was the only application made to me for a lease, and to that I have acceded.

With regard to game and its protection, Sir Robert emphatically though briefly says—

There is another subject which I think it right to advert to—there is another case in which the landlord has the opportunity, although he may know nothing of agriculture, to benefit the occupying tenant—I allude to game. (Cheers.) There are few more eager sportsmen than I have been and am; but seeing the competition to which I am convinced the farmers of this country are exposed, and must look forward to, I consider it to be the duty of every landlord to make some sacrifice of his personal pleasure, to enable the tenant to meet that competition. I believe that the damage done by the abundance of game is chiefly committed by hares and rabbits. I do not believe that the occupier of the land sustains much injury from partridges or pheasants—the chief damage is done by hares and rabbits. I have no hesitation in saying that I shall be pleased that there is not one single rabbit on the whole of my property, and that I shall do everything in my power for their destruction;—and, with respect to hares, I shall willingly forego the gratification of my sport; and if a tenant informs me that they exist in such quantities as to do him serious damage, I shall be perfectly ready to give orders for their immediate destruction, and reduce them to such an extent as will satisfy him that no injury can be sustained.

In conclusion, Sir Robert made some excellent observations on the benefits to be derived from farmers' clubs and agricultural associations. He alluded to the dying bequest of a wise man to his children, that if they dug the ground they would discover a hidden treasure. This they did; and, though they found no gold under it, they were rewarded by the increased fertility of its surface. He concluded by expressing his conviction that, by meeting frequently together—by landlord and tenant being brought face to face—and thereby learning each other's character—each other's wants and wishes, and ascertaining each other's views—a great improvement in the cultivation of the soil, and a great increase in its produce, must be the natural result, while those kindly feelings between the landlord and tenant would be fostered, which softened the gradations of society, and diminished the interval between wealth and poverty: in short, they might prove the means of increasing the number

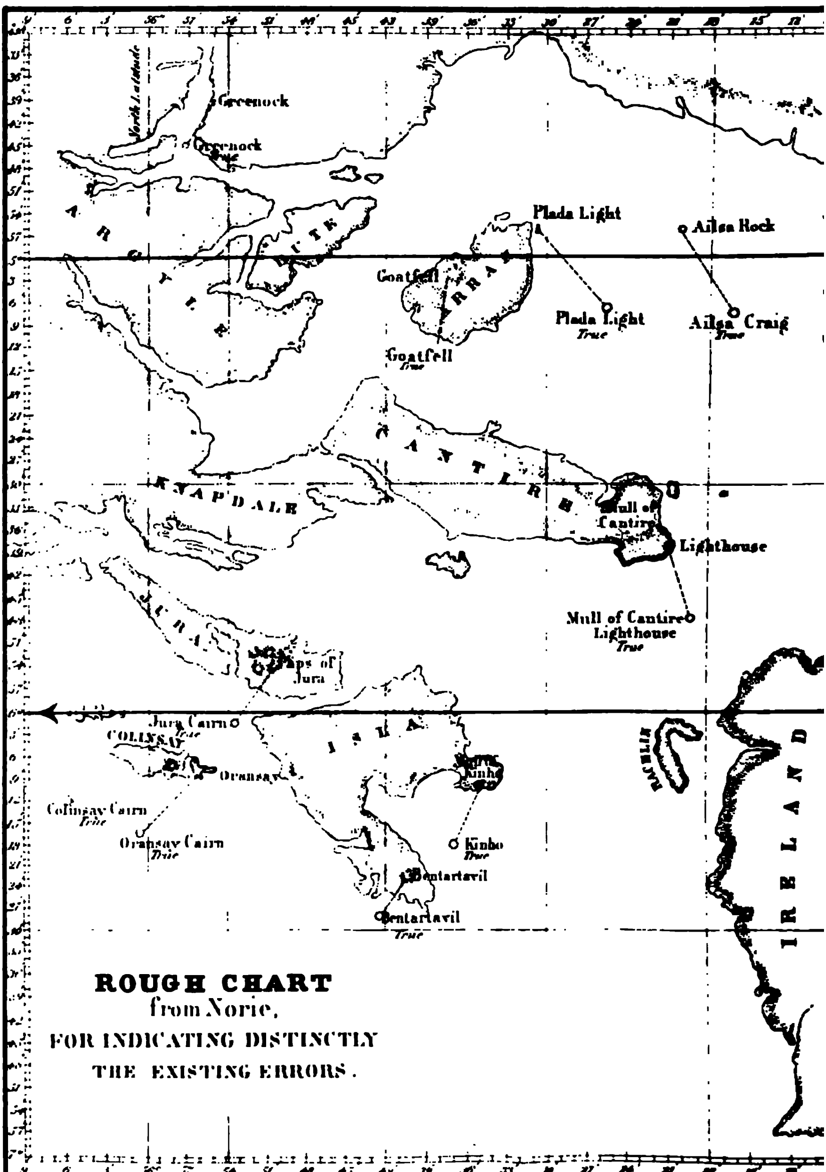
liberal and considerate landlords, intelligent and improving ıants, and a happy and contented peasantry.

Nor has Lord Stanley been less active than the Premier, ring the parliamentary recess, in lending his countenance and s eloquence to the furtherance of farming improvements. As airman of the Liverpool Agricultural Society, he made an lmirable speech, in proposing prosperity to that institution. is principal topics were drainage and fences. His experiences garding the first especially are well worthy of attention.

It was impossible to cast round their eyes about the country in which they lived, d not acknowledge that there had been a vast improvement in the practical agriıltare of this country within the last ten or fifteen years. In producing that imovement he firmly believed that this society had borne its full share, and he should eply regret if any circumstance whatever deprived it of that support which all who ere engaged in the cultivation of the soil ought to render it. Perhaps they would rmit him to make a few observations on two subjects which were of primary and tal importance in the science—for it was now becoming a science—of agriculture, ithout which all others were comparatively worthless. A real, effectual, and orough draining of the soil was of vast importance in the first instance, and it was e foundation of all improvement. Now it was quite true that agriculture was not pable of that indefinite extension by which the manufacturing interest, in its rapid ogress, had astonished the world, and astonished itself; but it was equally true at agriculture was capable of vast extension and improvement. The surface of e soil was limited, and the capacity of the soil was also limited; but they were nited in a much less degree than was generally supposed;—and he spoke with the eatest confidence when he said that, of the waste lands of this country, a vast proıtion was capable of producing a large profit on a large—an immensely large—outy of capital expended upon it; and, considering the condition of the country, and e increasing population of the country, it was not only their interest, but it was so their bounden duty, to exert themselves, and to apply their best energies, not of aews alone, but of the mind and intellect, to ascertain how the soil could be made ore capable of supporting the population. The importance of thorough draining as universally admitted, but, perhaps, he might be permitted to state two or three cts as practical results, which had come under his own observation, shewing that hat he was preaching to them, he was, in a certain degree, practising himself. In e course of the last two or three years, they—he spoke for his father as well as for mself—on behalf of themselves and their tenants, had put under ground nearer ree than two and a-half millions of tiles, and had thus fairly indicated their belief d confidence in the success of a great experiment. And why had they done so? very month that passed over his head convinced him that, so far from having done l that could be done, they had only made a beginning, and were only doing that which was not only their bounden duty, but, still more, their abundant interest to do. He ould state one instance of the practical returns which might be expected from orough scientific draining. In 1841, his father was about to inclose in the park Knowsley, a tract of about eighty acres. Of this eighty acres about twenty were rong clay land, with a very retentive subsoil, and the remaining sixty he rememered from his boyhood as the favourite haunt of snipes and wild ducks, and never w there anything else. In the course of the first year the sixty acres maintained, d maintained very poorly, during the summer, six horses; and on the twenty res there was a very small crop of very poor hay. It was impossible for land to e in a poorer condition; and they would agree with him when he told them that, breaking it up, they had some two or three times to dig the plough horses out of e bog. In 1841 the whole of this land was thoroughly subsoiled and drained, and 1842, what was not worth 10s. an acre the year before, was in turnips, and on that nd they fed off in five months, and fattened for the butcher, 80 beasts and 300 heep, and afterwards carted into the farm-yard 350 tons of turnips. In the present ear they had a very fair crop of barley and oats, which his friend Mr Henry would e very glad to shew to any gentleman who felt any curiosity on the subject. Now

he did not hesitate to say that that land was, at that moment, worth 30s. an acre. The outlay upon it for pulling up old fences, thorough draining, tilling and breaking it up, amounted to just £7 : 10s. per acre, just giving 20s. for every 150s. of outlay, and giving to the landlord a permanent interest of 14 per cent. on the money laid out on that unpromising ground. It happened that, in the same year, they took into their own hands land which had been abandoned by the tenant as perfectly worthless. It was a large field of twenty-two acres of very poor sandy soil. It was drained at an expense of £2 per statute acre, and in the first year they fed off on that land 120 sheep, the remaining part of the turnips being carted to the farm-yard, and he ventured to say that, at the expense of £2 per acre, the land was increased in value 10s. per acre to the landlord and 10s. to the tenant.

Whatever variety of opinion may exist as to the doctrines broached by our present ministers at these meetings, there can be none as to the example which they have set to the aristocracy and all landed proprietors. The march of improvement has commenced—the hand has been put to the plough—and such is the temper of the times, in more especially as it concerns the manufacturing interests, that we neither dare halt nor turn back even if we wished. Much has been achieved for agriculture, but much more remains to be achieved. The discoveries of the last fifteen years far more than outstrip the last fifty; nor have we the smallest doubt that, in the next ten, discovery and improvement will go on in a three-fold ratio. Look to what has been done by drainage and by manuring, by the use of steam, by the ingenuity of rural implements, by better breeds of stock, by greater knowledge in feeding? And yet these mighty benefits—capable of adding a-third more to the whole produce of the country—are as yet confined only to mere districts of the land. Old prejudices are throughout whole counties adhered to, and in others it seems as if these improvements had never been yet heard of. At one time it was supposed that the landlord had one interest and the tenant another. As a proposition admitting of general application, the thing is quite absurd. Their interests are inseparably connected together, and their prosperity will and must be mutual. In fact, this truth is so patent, that it cannot be longer misunderstood, and, therefore, it behoves both classes, in every district throughout the British empire, to make common cause. Hence the use of forming associations, where landlord and tenant, as on one table-land, and for one especial purpose, may meet and consult together; and it is delightful to see how these institutions are annually, nay monthly, extending, not only in point of numbers, but of respectability; so much so, indeed, that, in a few years, either a landlord or a tenant who is not connected with them in their endeavours after improvement will be a *rara avis in terris*. The lead has been taken by Scotland; and it is an honour to which she can proudly lay claim, far more worthy to be envied than feats of arms or extent of conquest. It is a victory over the obstacles of nature; and it is a triumph in the cause of humanity.



Maclure & Macdonald Lith. Glasgow

ON TRIGONOMETRICAL SURVEYING, AND ITS APPLICATION TO CORRECT THE MAPS AND CHARTS OF THE HEBRIDES.

By William Galbraith, M.A., F.R.S.S.A., F.R.A.S.

1. I have occasionally drawn up a short paper on surveying connected with Scotland, suggested to me by the very glaring errors which I had discovered to prevail even in our best maps and charts.*

From this and other causes, hundreds of human lives and thousands of valuable property are annually lost, as the calendar of our shipwrecks daily testifies. Though something continues to be done to improve the geography of our country, yet it appears to be very slowly felt. Indeed the extent of our foreign possessions makes a large demand upon the resources of the nation which cannot with propriety be withheld; but it appears somewhat strange that so little attention is paid to a survey of our own shores. I have looked into the latest catalogue of charts published at the Hydrographic Office, and while I observe new surveys of almost every coast on the face of the earth have been executed, either wholly or in part by British naval and military officers, yet, strange to say, since, comparatively speaking, the imperfect surveys of Mackenzie, nothing has been done for the Hebrides. I have searched catalogues in vain for anything recently published.

The shipping trade of the Clyde is certainly one of the most extensive in Scotland, and not the least in Britain, and *I shall shortly prove* that, *trusting* to the charts and maps now in existence, the master of a vessel making for the Clyde, while passing, from choice or necessity, near the shores of Islay, &c., in thick blowing weather, during the day, or not in view of a lighthouse at night, *must almost with certainty be wrecked, if his reckoning be right.* Is this a state of matters which ought longer to be tolerated?

2. The mode in which maps may be engraved admits of considerable latitude. They may be, in a great degree, plain, with a little hill-shading to mark mountain ranges more distinctly. They may also, however, be enriched with much more important information than they commonly possess, by adopting peculiar modes of engraving. That mode of finishing maps by *normal contours* indicating the same level at different elevations, either by wave lines or different bands of parallel lines, seems to be an excellent

* The New Map of Scotland, by Mr A. K. Johnston, for his splendid Atlas, just published, has been greatly improved in many points.

one for conveying correct information relative to different levels, each line or band designating a rise of a given number of feet. This method has been adopted by the French engineers in their new surveys so long ago as 1818. For the levelling of the sites of cities, such as Paris, each parallel marks a rise of *two French metres*, or a little more than 6½ English feet. For the level country *ten metres*, or 33 English feet, is chosen for the vertical distance or rise between the parallels. For our survey, 10 feet would perhaps be a good vertical rise for cities, 30 to 50 feet for our carse and other superior lands, such as those of Gowrie, Stirling, many parts of the Lothians, &c., to be continued to a height of 300 or 500 feet. The pasture grounds above these might be taken at about 100 feet between each band as far as 1000 feet, and those of the mountain ranges above this at 500 feet, as far as the summit of our highest mountains. In this way the corresponding parallels throughout the whole country would all become known in a manner somewhat exemplified by the celebrated natural parallel roads of Glenroy in Lochaber. A part of the Irish survey has, since 1838, been executed in this way, but, from some remarks made at the meeting of the British Association this year at Cork, it appears now to be stopped. I shall endeavour to fortify the opinions I here advocate, and which I have long entertained, by some important remarks by Captain Larcom on contoured maps, such as those I have attempted to describe.

3. It is important that maps constructed by the Government should exhibit the levels of the country in the most intelligible manner; shewing the heights not merely on the tops of hills, but round their sides, and through the valleys which traverse them. Such a system is offered by these contours. They are a series of horizontal lines at a certain distance asunder, and at a certain height above a fixed *datum*. The datum most commonly used is the level of the sea, doubtless from the shore-line being the limit of the land, and the point at which roads must cease, as well as from an idea that it is itself a level line, and, therefore, as a first contour, the most appropriate and natural *zero* from which to reckon the others. The section of the Association on Mathematical and Physical Science was aware that it has been much discussed whether the high water, the low water, or the mean state of the tide offers the most level line. This is a point it would be out of place to discuss here, but it may be stated that, in order to determine it as far as Ireland is concerned, a series of lines has been very accurately levelled across the island in various directions, and permanent marks left in all the towns and on numerous public buildings, and, at the end of these lines on the coast, tidal observations have been made every five minutes during two complete lunations. These observations and the connecting lines of level are now in process of reduction, the degree of accuracy obtained is such, that a discrepancy of 0.2 (⅕) of an inch is immediately apparent, and from them we may expect many points of interest.

The steeper the natural slope of the ground is, the closer together, of course, the contours will be, and the more oblique the road; where, on the contrary, the ground slopes very gently, the contours are farther asunder, and the road may proportionally more direct. By examining the maps of the Irish survey, on which contours have been drawn, it will be seen that they tell *sad tales* of the existing roads, every inch of which ascends and descends frequently, instead of keeping the gradual slope for its whole length. In order to exhibit these lines, it is propos

istead of adding them to the original copperplate, (which has a peculiar value as a official record of boundaries,) to make a copy of the plate by the electrotype, for he purpose of receiving these lines. Contour maps were thought of early in the rogress of the survey, but means were wanting for their execution. At present, owever, the outline survey being complete, and the general map, or map of the urface, being in progress, affords a convenient opportunity, which it is hoped will ot be lost. Dr Robinson (of Armagh, an excellent mathematician and astronomer,) inquired of Captain Larcom whether the progress of contouring the maps was proceeding, and how soon he supposed it would be completed for Ireland? Captain Larcom replied that, for the present, it had been suspended. Dr Robinson bserved that, whether he considered the value of this process in relation to the eneral interests of science or the most important practical economics of the country at large, he could not but deeply deplore the suspension, temporary though he oped it would be, of this great national undertaking; and he trusted that, before he British Association closed its present sitting, *the most energetic steps would be then to make such an application to Government as would induce them to resume this most valuable work.* He begged to inquire from Captain Larcom what the expense would probably be. Captain Larcom replied that he should estimate it certainly at ess than a farthing an acre. Dr Robinson—And the original price was probably ixpence or eightpence? Captain Larcom said—Perhaps sevenpence to ninepence. Dr Robinson—Then, at a cost of about one-thirty-second part of the original expense, his invaluable addition to that splendid work, the Trigonometrical Survey of Ireland, could be accomplished. If it was determined finally to suspend this work, he hould say that it was very like what the homely adage characterized as *penny wise and pound foolish.*

4. Such being the opinion of this learned astronomer in reference to Ireland, it might seem unnecessary to urge the same emand for Scotland, yet, strange to say, I am not aware that ny Scotchman, or society connected with Scotland, has had the atriotic boldness to claim for their country that invaluable ppendage to our maps. Indeed, from what I can learn, they eem rather to discountenance the idea of making any similar laim. *Seven hundred and fifty thousand pounds* have already een spent on the survey of Ireland, and *three hundred and fifty housand pounds* on that of the whole of Britain. Is this justice o Ireland? It is more. Even of this three hundred and fifty housand how much has fallen to Scotland?

In giving these statements, it is clear I make no charge against he excellent conductor of our survey or any of the officers under im. They are, I know, ready to meet the orders of Government, whatever these may be. I make no charge against the accuracy of heir proceedings, except so far as the published volumes of the urvey afford the means of testing them by a scientific examination of their results, and methods of obtaining them, which, if conducted in a fair and candid manner, can give offence to no one. ndeed, from officers connected with the Ordnance Map Office, I ave received various *data*, of which I have freely availed myself n the present paper; and, through Colonel Colby, by order of the Master-General and the Honourable Board of Ordnance, I received, about a year ago, that valuable continuation of the survey, he reduction of the zenith sector observations, made at different

stations in Britain, in which the computations are all made in most approved manner. It would be ungrateful in me not return my warmest thanks for these distinguished favours. I not to cavil, therefore, I make the preceding statements, bu benefit the public at large, in which all will participate.

5. Again, various colours might be fixed upon to designate ferent soils: a deep tint for dark loams, a shade lighter for cl another for gravels, a fourth for sand, a fifth for pastures, a sixth for our heaths. By placing this, which might be calle agricultural map, side by side with a geological map, there w be obtained every kind of knowledge required, both with re to soils and minerals.

It is impossible, however, in the present state of our knowl of the geography of Scotland, to form any such maps, and t great advance in, or the conclusion of, the ordnance surve must, in a great degree, remain very imperfect, the few co tions made by private individuals being comparatively insig cant. I have occasionally remarked that it would be of g consequence if the results annually obtained by the ordnance veyors were regularly published, so that private individuals n take advantage of them in the formations of plans of exte landed proprietors, which, as topographical information, migl embodied in county, or general maps of the country. responsible officers would perhaps be unwilling to commun their approximate results, yet requiring correction from comb operations; but still they might be given with that reserva though the small errors or minute inconsistencies remained t eliminated. These, at least, are my views on this important ject, in which I have had some little experience. When I b my inquiries I had no idea that the geography of Scotland so imperfect, and that the errors in the geographical positi many important points were so great in amount.

In the course of my summer excursions, I have made a cons able number of observations, astronomical and geodetical, which were corrected some very considerable errors in our maps.

The present little paper is a continuation in which I have bined all my observations made at Broddick, in Arran, ast mical, chronometrical, and geodetical, to fix the geograp position and height of Goatfell, as a standard point whe might be enabled to extend them to others definitely mark favourable weather, which for some weeks, during several ye

* Most of these have been communicated to my friend Mr A. K. Johnst he purpose of improving his map of Scotland.

watched with great care, in order to seize the favourable opportunity. I have been indebted to my friend Mr Alexander Bryson, chronometer maker, No. 66, Prince's Street, Edinburgh, for excellent chronometers on all these occasions, regulated with great care, which generally performed in a very satisfactory manner—and it is well known that a good chronometer is an indespensable requisite to every astronomical observer.

6. The instruments which I generally use for astronomical and geodetical purposes, is a six-inch altitude and azimuth circle, made by Robinson of London. It is provided with three verniers for both the horizontal and vertical circles, reading each to 10″, with a level, each division of its scale shewing 2″—the most convenient division of any. The instrument was regularly reversed each observation, and for horizontal angles the zero was occasionally changed to correct for eccentricity and errors of division as far as possible. The circles are cast solid, and not made up of a circular ring connected with numerous pieces fastened by screws. This, I believe, gives greater permanency and stability, and its powers are greater than its size would apparently warrant, when provided with a telescope magnifying only about twenty times—half the power of Roy's great theodolite as formerly used.*

To shew its accuracy, *thirty series* of observations, of about twelve readings each, in different years, reduced to 1840, give

the mean obliquity of the ecliptic at .	23°	27′	37.00″
M. Bessel, in the Tabulæ Regiomontanæ,	23	27	36.52
Difference greater than M. Bessel, .	0	0	0.48

This seems to prove that compact steady instruments, of very moderate dimensions, are comparatively better than large instruments of inferior construction.

Without farther remark, I shall state the observations made in different years to determine the latitude of my station at Broddick, and allow the different series to speak for themselves.

* Mr Simms of London has lately invented a self-acting dividing engine, to divide instruments on their own axes, *previously* fixed permanently, instead of dividing and afterwards fixing—the method usually employed. This is a great improvement, and will tend much to destroy eccentricity. I have been informed that Gambey of Paris has had, for years, a somewhat similar machine, but am not acquainted with the particulars.

Final Determination of the Latitude of Broddick Village i
Island of Arran, at the Gate opposite the Baker's on the E
End of the Row of Houses fronting the Road from Hamil
Inn to Strabane Cottage Gate.

Year.	Month.	Day.	Series.	Latitude Observed.	Seconds × No. of Series.
1836	August		10	55° 35′ 18.0″ N.	180.00″
1841	August	24	10	19.0	190.00
		27	4	25.0	100.00
		28	16	21.6	345.60
1843	August	9	10	19.1	191.00
		12	12	22.35	268.20
		14	14	17.3	242.20
		16	6	18.6	111.60
		16	6	12.3	73.80
		23	20	19.8	396.00
			108		2098.40

General mean of all the observations, . 55° 35′ 19.4
giving due weight to the number of observations in each s

In like manner, the longitude by chronometer in the same
is . . . . . . 0^h 20^m 37.18
which in space becomes . 5° 9′ 16.95

These are the ultimate results on which all the other deter
tions depend. As there may be still some small errors in
of course, the effect must be communicated to the other d
tions. From these, with the bearing and distance, I deter
the latitude of Goatfell to be . . 55° 37′ 35.
longitude, ... 5 11 18.1
and the height of the axis of circle, 2861.5 feet above the
tide.

The latitude of Broddick Castle, the seat of the Du
Hamilton, in Arran, . . . 55° 35′ 41.
longitude, ... 5 8 50.

7. As I had some difficulty to connect Ailsa Craig with
fell by the usual trigonometrical methods, I was obliged to
recourse to the method by depression, which I first gave wi
requisite precision in my book on Trigonometrical Surv
published by Messrs Blackwood, page 58, and more esp
140. The height of Goatfell being considerable, enabled
obtain the distance more accurately than I could almost
expected. Though I have had no means of comparison to

am inclined to consider it an approximation sufficiently truth, as no other deductions depend upon it.

series, the zenith distance of the bottom at the surface a, corrected for level, &c., was . 91° 21′ 8.5″
ier it was 91 21 7.4

these (1.) 91 21 8.0

eries the height subtended an angle of 0 27 34.7
ond, ... 0 27 25.7

both (2.) 0 27 30.2

the first result, by the formula just referred to, by three ns the distance was found to be 137224 feet
ch, and the second, the height will be 1097.9
onsiderable number of observations, the bearing of Ailsa om Goatfell, was found to be S. 6° 23′ 14″ E.
e bearing and distance here given, the latitude of Ailsa
. . . . 55° 15′ 11.12″ N.
itude, ... 5 6 54.69. W.

somewhat similar operations by angular measures, taken op of Goatfell, during several days in different years, g all my measures carefully, and, when possible, taking ge of a few lines and angles communicated through the e Map Office, I finally deduced the following results, ng upon the position and height of Goatfell previously . The bearings and distances of the different points are erred to Goatfell pile and its meridian, reckoning the from the north, easterly round the horizon:—

Name.	Bearing N.E.			Distance in Feet.	Latitude N.			Longitude W.		
ılomond, . .	28°	51′	15″	235929.7	56°	11	27.71″	4°	37′	45.56″
ıcampsie. . .	56	20	15	258722.7	56	0	52.91	4	8	9.01
to, ...	91	37	3	316276.3	55	35	33.24	3	39	34.64
rnsmuir, D. .	123	12	19	243998.5	55	15	24.22	4	12	34.47
sa Craig, . .	173	36	46	137224.4	55	15	11.12	5	6	54.69
ocklayd, Ireland,	232	52	56	277762.0	55	9	46.67	6	14	51.95
n Oë, Islay, .	270	59	0	227672.7	55	37	56.22	6	17	24.65
n Tartavil, .	278	34	5	261031.8	55	43	35.88	6	26	26.57
a Pile, . . .	301	28	38	195427.8	55	54	11.71	6	0	2.51
n More, Mull,	330	23	48	336845.4	56	25	32.41	6	0	37.62
All depending on Goatfell, previously determined to be in . .					55	37	35.48	5	11	18.15
these I may add from other sources—										
msay Cairn, .	...			...	56	1	24.30	6	14	58.10
bsay Cairn, .	...			...	56	6	34.00	6	9	55.20

The heights of these objects would now form an interestir addition, but I shall at present only subjoin one. By one seri the zenith distance of Benlomond from the summit of Goatfe

was	90° 12′ 0.1
By another	90 12 9.2
Mean of these two . . .	90 12 4.6

Combining this with the bearing, distance, and mean latitu as shewn in my book on Trigonometrical Surveying, forme referred to, page 64, the barometer standing at 27.222 inch and Fahrenheit's thermometer at 52.6°, we find that the sumn

of Benlomond above that of Goatfell is .	298.97 fe
Height of Goatfell, as before, . .	2861.50
Height of Benlomond, . . .	3160.47

Mr John Adie, optician, and I measured the height of B lomond simultaneously, by which I found the summit of Ben mond to be 3142.2 feet above the surface of Lochlomond. N if I could have ascertained the correct height of the surface the lake above the mean level of the sea at Dumbarton, a g comparison might have been made. That height does not c tainly exceed 20 or 30 feet. Taking it at 25 feet, the baromet height would be 3167.2 feet, agreeing very well with my pres trigonometrical one, since a small error may be accounted either from uncertainties in observations or atmospheric irre larities.

8. What amount of error there may really be in any of or these conclusions, I am unable with certainty to say; but I th it cannot exceed about 5″ in latitude, and 10″ or 15″ in lo tude; and if the principal points of any map of Scotland w all as well determined it would be very superior to any which now possess. Indeed, if the usual methods of determining probable error were applied to each, it would turn out to be less than what I have stated; but I have some doubts of the mula's efficiency to detect that error on the grounds now to stated.

From numerous observations by the same circle I found *mean obliquity* of the ecliptic on January 1, 1840,

to be	23° 27′ 37.
M. Bessel of Königsberg, . . .	23 27 36.
Mr Henderson, at Edinburgh Observatory,	23 27 36

Here each value diminishes by about half a second in success while the doctrine of probabilities, as usually applied, would about the same as a probable error in mine, and a small frac second likely in each of the others less than their differe

my observations for latitude were made upon the sun ιuilæ to the south of the zenith, and on Polaris to the avoid, as far as possible, any small bias of my circle, as ıtly the case, especially in the repeating circle of Borda, is often considerable in amount, and the error in my nust also be affected by any small error in the position served objects as given in the *Nautical Almanac*.

ror in the sun's declination is now certainly small, that ed stars is generally considered to be much less, though han is commonly believed.

ean declination of Polaris in 1840 is, by

Almanac, . . .	88°	27′	21.94″ N.
;h Observations, . .	88	27	22.17
Regiomontanæ, . .	88	27	21.99
ance des Tems, . .	88	27	22.00

all agree sufficiently well, and no remarks are required.

eclination of α Aquilæ in 1840 is, by

Almanac, . . .	8°	27′	0.22″ N.
ance des Tems, . .	8	27	2.80
Regiomontanæ, . .	8	27	1.49
;h Observations, . .	8	27	1.90

he difference between the *Nautical Almanac*, the book nd the others in succession, are 2.6″ 1.3″ and 1.7″. Would ordances have been believed, at such favourable altitudes tion, in the present state of practical astronomy? Would ine of probabilities shew a small fraction of a second in yet manifesting such remarkable differences! What of the annual parallax of the fixed stars, amounting to a-third of these quantities, determined too by the same instruments? These are trifling discordances, however, l with those by the repeating circle of Borda, especially servations of Colonel Coraboeuf, made to determine the of the Observatory of St Martin d'Angers. They are detailed in the *Nouvelle Description Geometrique de la* deuxieme partie, from page 464 to 499 inclusive. The Gambey of Paris was 0.325 of a French metre, or glish inches in diameter. The observations taken on le of the zenith were very consistent, and, therefore, able error,* as it is generally called in these, on each the zenith, taken separately, would be remarkably

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: this name may tend to mislead, unless properly restricted. It is more o the deviation from consistency, since a *change*, say of 10″ in all, on the would not alter its value: in fact, all constant errors of the instrument, e excluded.

The latitude by Polaris, on the north of the zenith, was	(1.)	47°	28′	15.21″	N.
By α Serpentis, on the south,	(2.)	47	27	59.41	N.
Mean, accounted the latitude,		47	28	7.31	N.
But the difference of these is no less than	.			15.80	

The first of these was determined from	.	640
repetitions, and the second from	.	332
In all, ...	.	972

What would now be thought of the small probable error of a fraction of a second in each of the above determinations—that smallness arising entirely from the consistency of the series made on each side of the zenith separately, when their difference is no less than 15.8″ from such numerous repetitions?

Something similar may be said of the examination of the divisions of a circle at *one temperature* to be used at *another*.

From these instances it is manifest that it is extremely difficult to fix the positions of points in a survey astronomically with great precision, and, therefore, I demand no more for mine than what, by competent judges, they justly deserve.

9. Again, it is as difficult to introduce into the lineal and trigonometrical operations extreme precision as into the astronomical.

Mr T. Galloway, in a paper read before the Royal Astronomical Society of London, vol. v. page 263, of monthly notices, has applied the method of the *least squares* to a part of the trigonometrical survey, commencing with the *base on Hounslow Heath* and including ten stations. "The final results," says he, "differ extremely little from those given in the *survey*, the greatest difference in the length of any side amounting only to about half a foot, and this in a distance of nearly eighteen miles."

But what, we inquire, is the real length of the base on Hounslow Heath in a known measure? There is some doubt that this can now be determined in a satisfactory manner.

In the Encyclopædia Britannica, vol. xxi. page 361, the value of this base by glass rods in imperial measure on the heath, is stated at

stated at	. . . .	27403.38 feet
By the steel chain, at	. . .	27402.38
Mean of these on the heath,	. .	27402.88

In which that by the steel chain is *less* than that by the glass rods; whereas, in so far as is generally known, it ought to be greater, since the corrections here applied to reduce them to the imperial standard have been erroneously computed.

true results, according to the best information I believe own, are as follows:—

base on Hounslow Heath, in terms of his own scale by ds, 100 feet above the mean level of the sea, at the tem-e of 62° of Fahrenheit's scale, is		27404.0843 feet.
ion of this to imperial standard	+	0.6699
ase on the heath, (1.) .		27404.7542

ke manner, Mudge's base by steel chains, in terms of

en's scale, is . . .		27404.3155 feet
ion to imperial standard .	+	1.8936
's base on heath is, (2.) .		27406.2091
ference of the two is . .		1.4549

he bases of Roy and Mudge seem to be of about equal

ty, their mean may be taken, which is		27405.4816 feet
ion of this to the level of the sea	—	0.1312
t the sea level, . .		27405.3504
the Encyclopædia, . .		27402.75
an the preceding by . .		2.6

true length, therefore, exceeds that given in the Encyclo-Britannica by 2.6 feet. Hence an error of 2½ feet nearly en committed in the necessary reductions of the original a far greater quantity than what can be attributed to the of the small correction from the employment of the of the *least squares*.*

nce it is of far greater importance to perform all the neces-erations, astronomical and geodetical, correctly, than to complex methods of calculation, with the idea of obtain-*fect results* from *imperfect data*. The correction of half a a distant side is of little consequence, if the original base rom which all the others must be derived, be erroneous to ount of *two feet and a-half, or five times that quantity*.

hese remarks I by no means must be understood to put a alue on correct methods of computation. All I mean is, finements in calculation are useless if the *data* on which e founded will not warrant them.

I have, in several previous papers, pointed out the errors, tly amounting to five or six miles, in various maps and ; such as Arrowsmith's map of Scotland, coloured by order Lords of the Treasury in 1840, according to Dr Maccul-

* any instances the third angle was not measured, and, therefore, the method st squares cannot in that case be rightly applied.

loch's Geological Survey, at various points in the Firth of Clyde, as well as in those of our marine charts.

I have also occasionally pointed out personally to some of the constructors of our charts, as my friend Mr Norie, &c., the grave errors of those reckoned our best charts, but the reply was, that we cannot help ourselves, since almost nothing has been done for the Hebrides from the time of Mackenzie, about a century ago. Because Government does nothing, should we as *private* individuals expend large sums of money on surveys for the *public* service?—a reply sufficiently conclusive.

I shall now direct attention, as I mentioned at the outset, to the charts of the Hebrides, especially about the islands of Islay, Colonsay, &c. Starting from and beginning with Goatfell, as determined by observation in the tables, pages 262, 263, &c., I find it falls in *Kilbrannan Sound*, about a mile W. of Penrioch, on the western shores of Arran.* Again, I lay down Ailsa Craig, and I find it falls about *eight miles* in the Firth of Clyde, S.W. of the position on the chart. In like manner, the Mull of Cantire Lighthouse falls about midway in the channel to Ireland. Ben Oë, (or Kinho, as it is called on the chart,) in Islay, falls in the middle of Lochindaal. Bein Tartavil, on the western peninsula of Islay, about two miles W. in the Atlantic. *Oransay Cairn*, about five miles W. of the central shores of *Colonsay*, and Colonsay Cairn, itself about *four miles and a-half* N.W. of the most northerly point in Colonsay, called on the chart Ru Yea, or, as it is called on other maps, Point Prua, or about *one-third* way across the sea towards the Ross of Mull! †

By these instances, of which their accuracy cannot in any appreciable degree be invalidated, I hold that I have proved the proposition enunciated in the first page of this paper, namely, that *the master of a vessel, trusting to such charts, must almost with certainty be wrecked, if his reckoning be right.* These must also infallibly, at the same time, ruin our Marine Insurance Companies, of which we have lately had notable instances in both Edinburgh and Glasgow.

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* See accompanying chart.

† Almost all other charts which I have seen are equally bad, and some even worse, as those of Blachford, &c.

THE FARMERS' NOTE-BOOK.—No. III.

Characteristics of 1843. By Mr Towers.—If the reasons assigned at page 341, No. 59, of the Quarterly Journal of Agriculture, were valid, and sanctioned the attempt to present a summary view of the weather and agricultural progress of the year 1842; if, at the close of that year, anxiety prevailed, with much perplexity, concerning the product of the harvest, "the operation and probable results of the corn-laws, the tariff, and the prospects of the farming interests"—surely no apology can now be required for an attempt to retrace the progress of the late more singular year, (1843,) wherein the minds of all concerned were agitated in no common degree, not only by the actual condition of the weather, and its effects upon the crops at several interesting periods, but by the reports in the public papers, which were so at variance, so conflicting, that, up to the hour when we write these lines, no correct opinion can be formed, and we must patiently wait the trial of the winter ere the true state of affairs can be brought to light.

It is curious to observe the progress of inquiry. Some years ago, if we took up a newspaper about the time of harvest, a few crude and bold assertions as to the probable issue were all that could be collected; no one thought of causes—the sun shone, or it rained, or hopes or fears prevailed, and there an end. But now we find every one alive—the journals teem with opinions, experiments, trials, new discoveries; yet we cannot perceive any corresponding spirit among the farmers themselves, and, what is still more singular, we have never, in one instance, detected an agricultural magazine, or any work upon agricultural chemistry, among the few books which they possess. Who then are the writers—who the readers—of those reports, suggestions, and scientific notices, which abound in the columns of the *Mark Lane Express*, and of the many meritorious agricultural publications which now enrich our libraries?

Necessity is the mother of invention; and thus it has happened that, to meet the wants of a rapidly-increasing population, the arts have so advanced as even to anticipate every demand. In practical agriculture we do not trace a corresponding improvement; the sons of the soil, with a few brilliant exceptions, continue to plod on in the same beaten path of routine; yet there is an advance, otherwise we should not meet with the never-ending still-beginning suggestions, all tending to exalt agriculture and enable it to take rank among the sciences.

The establishment of the Royal Agricultural Society of England, with its paramount influence and continual increase of

members, is a sign of the times. What, in conjunction with it noble predecessor, the Highland and Agricultural Society of Scot land, could *it* not effect? Every district also has its society, whos avowed object it is to stimulate emulation. But this is not all Whitfield Experimental Farm in Gloucestershire, has been com mitted to the able superintendence of Mr J. Morton, by Lor Ducie, and a college of agriculture has been announced, unde very high sanction, near Cirencester, also in Gloucestershire.

Thus we perceive "a promise of good things to come," which it is to be hoped, will be realized to the utmost.

The meteorology of 1843, could it be faithfully detailed an rendered general by a comparison of correct observations, woul be a very interesting document; but it so happens that, eve within three or four miles of London, barometrical and thermo metrical notices, taken weekly, differ so essentially, that th tables cannot furnish any correct data—discrepancies even to th extent of 7° being observable in the reports of the same day.

In attempting, therefore, to retrace the phenomena of the yea all that can be done is to refer to observations carefully take at three periods of each day, in one given locality, thirty mile west of London, and then, by comparing the actual condition c the growing crops, and noticing the apparent effects produce upon them by meteoric transitions, persons at a distance may b enabled to arrive at something like corresponding results.

One other introductory remark must be permitted. Durin the whole of the late harvest, complaints had prevailed of "blight, loss of grain, and general poverty of the wheat ears; while, o the contrary, reference was as frequently made to the magnificen crops of 1842. Now we perfectly recollect that, during th splendid season, complaints of poverty, of short yield, of indiffe ent quality, were exceedingly prevalent; and, in proof, we hav only to refer to the central paragraph of the *Characteristic* p. 343, wherein it is stated, that "the surface became har bound, superficially dry and warm, but cold at bottom. Henc the reports concerning the wheats continued to be discou aging, while the spring corn was deposited in a bed certainl unpropitious to its even and healthy progress." Again, p. 34 "farmers still complained, although barley was ripe about th second week, (of August.) that no one crop came on kindly, c according to expectation, under the influence of a sun so exce sively hot that patches were green, while, in others of the sam field, the corn was shedding, and that, in some instances, th straw was dead at the ground while the grain was milky."

The straw of 1842 was short, but the sheaves, though smal were ponderous. The straw of 1843 has been abundant, an proved a most seasonable supply: for the farmers had not suff

ent of the last year's to shelter the ricks. Of theie yld and ality of the grain, accounts are too contradictory to enable ny one to form even a rational conjecture; in all probability it ill ultimately be found a fair average.

In 1842, the year opened with floods upon the lowlands and iver valleys, owing to the profuse rains of the previous autumn; nd apprehension prevailed that the *small breadth* of wheat which it had been possible to sow must be seriously injured. But, in 1843, the wheat on the 1st of January covered the rich ands; for to a more benign bed had a vast abundance of seed never been committed.

January was, on the whole, fine and mild. On one occasion only, (3d,) the night thermometer marked 25° Fah., *i. e.*, 7°, of frost. The peculiarity of this month was the great depression of the mercury between the 11th and 16th days. On the 13th, our instruments shewed 28 in. 20 cts., when a prodigious storm of wind raged all day; a little snow fell during the gradual decline of the barometer, but it did not lie on the ground. The month terminated like spring, and February, with very trifling exceptions, retained the same character. Thus it was no way surprising that the winter corn, of which the breadth sown was extensive, should be gay, and in many rich fields rather luxuriant. On *poorer*, heavy, or late-sown lands there was a marked exception, and some farmers could hardly see the blade or its green tint above the surface—insomuch that they began to talk of destruction by the wire-worm. This remarkable difference in the appearance of the wheats will be found worthy of consideration.

March, to the 17th, was a period of splendour, and never had been surpassed. Then, however, occurred a phenomenon—the first prognostic of evil. After a gorgeous sunset, the evening continuing bright, excepting a slight haziness in the western horizon, a *pale luminous beam* suddenly became visible in the west, ascending at a low angle from the haze, with perfectly parallel edges, till it terminated below the stars *Rigel* (Orion) and Aldebaran. It fluctuated very little, and the stars were seen through it; the whole duration with us could not exceed thirty-five minutes, or from about eight o'clock to half-past eight. It did not set, but vanished at once and completely. Other persons at a distance observed the same appearance and termination; and, therefore, it was registered as a magneto-electric beam, not dissimilar to, though far less extensive than, the arch which was seen in 1826 or 27, and then styled by some meteorologists *Trabs electrica*. Subsequently, astronomers have considered the beam of March 17th a *comet!* but though the existence of such a body about that period is not denied, yet surely

it may be asked, whether experience has ever warranted th belief that a true comet, brilliant at eight o'clock, equally so a twenty-five minutes after, could fade and pass totally away with in the five succeeding minutes, so as not to leave the faintes trace, when the stars *still* remained visible which had been see through its substance (if the term be admissible)? The whol appearance resembled that of an auroral beam, and its disap pearance corresponded with that phenomenon. On the 18t however, in the same situation, and nearly at the same insta of time, the beam was again visible to us and others, but wi far less luminosity, and it vanished within fifteen minutes, an finally, for nothing further was discerned in our locality; an therefore, the identity of the beam with the comet announced l astronomers became more problematical. As a *prognostic* it w *considered fatal to the weather.* The *Equinox* was at hand, ar this circumstance made a change of weather, at a period so cri cal, of far more consequence. It was remarked that, during t three preceding fine weeks, the wind had not blown from the after the first three days; from the 18th it veered to W. by N thence to E. and S.E., the barometer continuing to fall till the 23 when it turned, and gradually ascended to 29 in. 83 cts., the on rain that fell was on the night of the 22d, and again at mid-d of the 31st, but the temperature was low and ungenial.

April, however, came in with a promise, and the weather becan much meliorated; thunder, on the 2d day, brought warm showe which continued for a day or two, and sufficiently moistened t parched land. On the 5th evening a strong luminous arch aurora borealis illuminated the N.—this was followed by a boi terous day; S. and S.W. winds prevailed, till, on the 9th, t current set in from N.E. At this period the corn-fields pr sented a picture of beauty; every one remarked the massive he bage of the densest, rich, verdure: in a word, the year, so far it had gone, was considered perfect—the wheat in extensi breadths, the oats rising favourably, and some barley deposit in land the temperament of which was unexceptionable.

On the 10th, however, a quantity of snow fell; the 11th a 12th were keenly frosty; 13th and 14th very cold, with mo snow and some hail. In the weather-table, in Chiswick, 1 of frost were recorded; in Berks we did not observe above but the wheats shewed manifest signs of much damage: t blade of the leaf became at first of a dark purplish hue, then y low at the tips, and, finally, striped and blotched with buff colo throughout. This motley discoloration proved that a great po tion of the leaf was decomposed and torpified, and that the gra must suffer in proportion. It did so; and we venture to asse that upon all those rich lands whereon the gay, forward corn w

sted to the rigour of this Siberian visitation, the stripiness ɘ foliage (which never abated) became a sure indication of stunted condition of the grain which was certified at the of harvest. Thus a belt, extending east and west of the polis, of the finest wheat-land of South Britain, received to the extent, perhaps, of one-third of its grain. A sample eat, produced upon a neighbouring farm, was shewn us a few since. It abounded with thin and shrivelled seeds, fit for ig but chicken meat; and our neighbour told us that all heat from which, when in sheaf, he formed the highest tation, had, under the flail, yielded a very considerable porf poor tail, resembling the sample he then produced.

king every allowance, therefore, for exaggeration, we are n that the discoloration of the leaf could not fail to induce y of plant and produce; and as this fact appears incapable itation, it becomes the more needful to refer to evidence of rary character, by which to prove that, *where the causes of y had no existence*, the result of the crops must be fully comory.

erring to the July number of this Journal, page 99, we -" From February to June the weather has proved cold. y, the rain increased considerably, so much so as to deluge ver lands of England, and to put a stop to turnip-sowing tland for several days." We stop here for a moment just firm the general facts of accordance. The weather, though id sunny in the south, was yet cold to the feelings; hence, ı the autumn corn throve to perfect beauty till April, the was strong; but when, after the paralysis by the frosty , the cold deluges of rain swamped the lands, preventing he required weedings, the glorious sun of June, that comed the *hay-farmer* with one of the heaviest crops ever d, forced forward the straw of the wheat, which then pindling and weak, so that, by the first wind, it was in places lodged, and choked by thistles and other rank which surmounted it.

m *South Wales*, where an agricultural person of great experesides, a letter communicated the fact that, during many turnip-sowing was of no avail, three crops being destroyed ession by the fly; yet, at length, turnips succeeded, and rowing well at the time when the corn crops—a full aververe all secured in prime condition.

esume the quotation—"Another peculiarity of this season is *interrupted* depression of the temperature. There have been sts of heat to encourage vegetation, and then returns of check it; but cold, cold, always cold, whether with sunır clouds."

This depressed temperature, with crops late when compared with those of our rich, forcing lands, permitted their safe and gradual advances; and so it happened with our poorer soils—whereon we know that immense products were obtained—while in spots not remote an acre yielded little more than the seed sown.

It is much to be lamented that the *good* is overlooked, while the exception, however local and restricted, is magnified and diffused as a national calamity for hundreds of miles; but so it ever was and will be, till selfishness and self-interest cease to be the governing principles.

On the 15th of June, the rain, which seemed to be confirmed for the summer, suddenly ceased, and, on the 16th, the sun broke forth with all its splendour; hence, with hardly an exception fine but not warm weather continued till the immense crop o meadow grass was carried in in a state of the highest perfection It has generally been remarked that, when rain sets in prior *to*, i will continue till *after*, turn of day; but this year furnished a exception; had it been otherwise, the grass would have decaye at bottom, as it did in the corresponding season of 1830, whe the rains of June continued to fall till the end of the month.

They who can refer to our observations of 1842, (p. 343,) wi notice the exceeding difference of the weather prevailing durin May and June of that year. Had the sunny weather continue into *July*, the harvest would have advanced rapidly; but, on th 29th of June, it set in cloudy, and so continued till the 6th c July, with showers. On the 5th, with a heat of 82°, a violent an extensive thunder storm occurred, which was chronicled through out the provincial press as being most destructive. (The 5th t 7th of July have been noted for thunder storms of late years. The weather throughout the month was fickle, and, as a whol far too gloomy, though the temperature was rather higher tha that of 1842: its minimum in the nights being registered a 53° 6′; maximum in the shade, 71° 3′—taken as averages of a the observations added together.

As the month terminated with showery weather, alarm bega to increase, and our journals took especial pains to remind th readers of anticipated destruction, or, at least, of most seriou injury. The consequences of the now assured late harvest, an of ultimate shortness of crop, were pointed out, and dwelt o with a gusto that plainly shewed the proneness of the huma mind to hug calamity rather than encourage the anticipations hope.

August came in very fine, and during the month we had fou teen really sunny days, and many that were partially fine, thoug cloudy at some period. Three or four thunder storms occurre That of the 9th is noted for its extreme duration, and the amazin

xtent of country which felt its ravages. The average temperature of all the days was, at least, 2° below that of the superb August of 1842, and wheat harvest was generally ten days later; yet we had some cut on the 5th and 6th days.

But what can be said of *September?* It was the most benign, magnificent season of the whole year: quite an exception—*sui generis*. The month opened with 60° min., 76° max., and 65° at ten o'clock P.M. During the three first weeks the weather was hot. On the 22d and 23d, with wind at N.E., brilliantly sunny, the *equinox* of *autumn* was completed, and the sun entered the descending signs.

We have long been in the habit of noting this critical period; and are induced to consider it the only prognostic of the future weather which experience sanctions as probable. If the late indication be correct, we may expect a northerly, clear, and, therefore, keen winter; but as there have been occasional exceptions, the theory is alluded to with all the modesty of doubt.

The main of the harvest was secured in a state of perfection during this month, and nowhere more so, as we have reason to assert, than in Scotland.

The *turnip* crop improved gradually throughout August and September, but its early progress had been so opposed, that it appeared on the whole uncertain and irregular. The great corn districts of England do not, it should seem, compete with those of the north in the culture of this important crop. The character of the plants at the middle of October, we should judge to be bulk and height of foliage, with comparatively small bulbs; the same remark has been made by some who inspected the crops in the south-east of Kent, which, at a distance, appeared strikingly fine. The whole season from April to October had indeed been peculiar, therefore it is not surprising that the effects should be perceptible.

Among the phenomena of the late remarkable September must be noted the extraordinary height of the barometer. The average height quoted in the British Almanac for September is 29 in. 91 cts. In 1842 there were but nine days in which the mercury rose above 30 in., and our highest mark was on the 2d day, 30 in. 11 cts; but in the last September the mercury was above 30 in., or from 30 in. to 30 in. 40 cts., during the first thirteen successive days. It then receded on the 14th and 15th to 29 in. 80 cts. 90 cts., but subsequently rose to 30 in., thence to 30 in. 50 cts., gradually falling to 30 in. 19 cts. on the 26th. The remaining four days (making up six in all the month) it sank below 30. We can trace nothing similar during the long period of years wherein a diary has been kept, and

therefore chronicle the circumstance with that of the equally extraordinary weather of five-sixths of the entire month.

October commenced with cooler, yet fine weather. Rain began on the 7th, and the temperature declined rapidly, and there was a total absence of sun till the 12th. The rain was very seasonable, as the ground became too hard and dry for the plough. Much wheat, however, was sown between the 15th and 25th in the west of Berkshire, and, doubtless, elsewhere; but in Kent, particularly the Isle of Thanet, wheat season rarely takes place till the middle of November. Our first frost occurred during the night of 12th, 13th, and the cold became very severe through the following week—we saw 7° of frost on the morning of the 20th, and other diaries quoted 8° and 10°—but the frost went off with rain from the westward. Since, and to the close of the month, there were three alternations of hoar-frost, rain, and mild weather, and the settled rain of 29th, 30th, completely glutted the surface of the land.

We stop here, as time will not be afforded to extend the remarks further. What the weather of autumn and early winter may be will be decided ere this paper meet the eye of the readers. The prognostic of the equinox has already been weakened by the alternations of frost and rain above noticed.

The Influence of Pasture on Sheep reared on it. By Mr William Hogg, Stobohope, Peeblesshire.—Sheep, as they exist in this country, have a twofold character—a general character, or what belongs to them as a species, and a particular character, or that temperament of constitution which they derive from the pasture on which they are bred. The qualities essential to them as a species are, producing wool each year after being one year old, shedding two incisor teeth, cloven-footed, wild; for domestication is an artificial state, effected only after considerable intimacy, and tasting of human food—this reconciles sheep to human company and human kindness, and disposes the creature to look to man for help in every emergency. These inherent peculiarities belong to sheep as a species. Before tracing their connection with the pasture, it will be necessary to state that pasture may justly be considered as of two divisions—dry, firm, lea pasture, often less or more intermixed with heath. This soil produces the finer grasses, though not in great abundance; the animal which it rears is small sized, of a compact form, hardy, excretions of all kinds small, constitution sound, considerable flow of animal spirits, not easily overcome with privations, and, as the system in all its parts is, as it were, crowded together, it is subject to inflammatory diseases, whether raised by external injury or by the

ression of its natural evacuations. Another description of ures are such as are spread out on an easy downy surface. e flourish all the strong coarser grasses, with a good part of e found in the former division; but they are here rough in stem, and hold far more fluidity—all the plants peculiar to a p deep soil arrive here at perfection, and a soft *lathy* quality ades the whole. The animal here feeds to excess—viscera ase to a great size and weight—the carcass is large, loose, incompact—staples of the wool generally long, inclining er to coarseness, if pains be not taken to keep the fleece —not much animation—and, for the most part, in their fifth , swell out to a great belly. The constitution does not now me invariably unsound, it rather becomes unwieldy, and bursome for the animal to search for and gather its food; evaions at all times profuse, and that natural purgation common ll sheep in spring is here apt to be continued well into ner, which not a little delays the animal's mending. The ses peculiar to such a constitution and such a pasture are plethoric description. If the spirits are broken by any rtune, ill-usage, or a severe winter, the rot, with all its bling symptoms, appears. Should this disease not manifest , yet the creature falls into an unprosperous, unthriving ition, having slight signs of sundry diseases though the sive symptoms of none. It, however, turns useless and dies. a these facts it must not be surmised that I suggest this e common fate of entire stocks bred on soft pastures. Though onstitution is far from being unsound, yet it is quite inferior ose reared on the first division: it is not so strong and hardy. soft constitution is burthened with infirmities and disabilities h the former is altogether unconnected with, and an interion of thriving, which ill-usage or ill seasons bring on indial sheep of this constitution, generally terminates in the rot, lments similar to it. Again, almost each distinct pasture s a tinge to the fleece; this tincture is generally attributed e colour of the upper stratum of the soils; and, when we ider how assiduously thriving sheep amuse themselves on ptions or openings of the stratum, this cannot be doubted; here is an imbuing quality in the herbage which communicates ge to wool independent of that inserted into it by friction; whether this is produced by the quality of its food after being n, or is imparted to the wool as the animal traverses its ure in search of food, I can scarcely determine. But pasture cises an almost uncontrollable power over the shape. If it s not interfere too much with the breed, the pasture will adjust size to what it can itself support; but how it determines the rnal shape remains as yet unaccounted for. In some cases

the shape is unexceptionable, that is, the figure, motion, an of the stock, indicate strength, spirits, and health; in ot is ill proportioned or defective in those points which insu mation and activity. The most common as well as the mo ful defects are, low and thin in the forequarters, coar lumpish in the posteriors, narrow or sharp backed—i oblique and ambling, splay-footed, &c. Though the last conspicuous among individuals, they can scarcely be sai peculiar to a stock in general, but the obstinacy with wh of these defects resist a change for the better indicates t communicated by the soil, are interwoven with the const and, if strenuous and uninterrupted means are used f removal, they may, in a small measure, disappear, or the guishing peculiarities of the deformity not be so strongly r But, rather than relinquish the animal altogether, if v exertions are still made for their utter suppression, the c tion not unfrequently yields with the struggle—it falls unprosperous sickly state, and, finally, ends in being an fitable useless creature. Indeed, man, for no end wl regularly and constantly interferes with the propagation o though accession of fresh blood be necessary at tin keeping the animals healthy, recruiting the spirits, ing animation, &c.; yet an often transmission of ne into the progeny prevents the spirits from acquiring a nent and steady flow, or the body from settling into and useful proportion of strength. From an actual surve position, altitude, and qualities of such an extent of hill- as is generally set off as a sheep farm, one accustomed rearing of sheep stocks, and to notice the connection whic between the animal and its pasture, may discover with t certainty whether the constitution will be hardy or sickly— of a large or small bone—whether yield a scanty or a fleece; and, from these peculiarities, may be enabled with an accuracy which may be depended on, and whicl found in general to be correct, what are the most preva cases to which the stock is liable; but the properties in which so forcibly confer the external figure has never ye know, been discovered. Wherever that plastic power resid convinced that the way and manner which the sheep a themselves to, in pasturing their allotted range, has no influence in forming the exterior shape; and it is cert the method of pasturing is regulated by the soil, so that qualities of the pasture lie at the foundation of all pecu whether natural or acquired; but yet an uneasy of collecting the food, if continued in for a length of ti come in to the aid of those ocult qualities in the soil wh

the shape, and enable them to act with greater and more certain vigour. It may be thought that, if the figure of each individual in the stock is unexceptionable in its first application to the pasture, there will be no difficulty in perpetuating this shape almost to any length of time; the reverse, however, is certain. The pasture may accord with the proper figure—may support it in its most important points; but if an adverse property reside in the pasture, it will imperceptibly alter the original form, by imposing on each successive crop of lambs that mould and manner which it is its own exclusive property to give.

There is a train of circumstances which never fail to alter the true shape, not only of the subject on which they immediately act, but also on their progeny. Suppose an individual sheep, or say stock of sheep, are reduced very low in habit by the sufferings of a severe winter: First season they somewhat shrink from the true figure; but suppose, as is often the case, that for two or three seasons the same privations continue, the departure from the true figure is evidently on the increase, is transmitted to the issue, and the deformity becomes in a sense habitual, though not in so absolute a degree as that which the soil imposes. In this case, if good seasons and prudent management co-operate, a restoration of the right shape is possible; but to establish a true and fashionable form on a stock whose plastic influence seems to confirm a defect in the shape is impossible. The change of stocks from the Heath to the Cheviot breed has not a little altered the disposition, look, and manner of sheep; but when all traces of the former are completely obliterated, and the peculiarities of the latter startlingly confirmed, what reprehensible points the pasture was the cause of in the old breed are still found to be blemishes in the new. From the above notices, it may be inferred that the proper figure and shape of some stocks can with far greater easiness be brought to a just proportion of parts, and kept at them as a right standard, than others where the qualities in the soil operate to the production and continuance of defects. This is found in fact to be the case. Some stocks require little attention; others, if the manager make strenuous and incessant endeavours to establish an useful figure, may, perhaps, enfeeble the whole system by too frequent accessions of new blood; for, to continue sheep profitable, healthy, and beautiful, the line should not be too often disturbed with intromissions from other families, however pure.

To write ever so explicitly on this subject can convey no perfect notion to another person's mind of the dissimilarity which exists between sheep stocks reared on different pastures; one single look over them would make the idea more distinct, and more certain of the inequality, than any words can convey; but the fact

that each pasture impresses its peculiar shape, air, and manner, need not be doubted, and this unlikeness exists after every safe method is taken to bring them to a uniformity.

*Bischoff's History of Woollen and Worsted Manufactures and Sheep.**—We take blame to ourselves for not having brought earlier under the notice of our readers a publication in which so many of them must necessarily feel a great degree of interest. A work professing to give a comprehensive view of the first introduction to this country of the woollen manufactures, and the various vicissitudes they have since undergone;—a history of wool in all its different kinds and diversified modes of treatment, with the numerous legislative enactments affecting it, both as of home growth and as imported from other countries;—together with the appropriate addition of an account of the various kinds and breeds of animals to which we are indebted for this invaluable commodity—must be a boon highly appreciated, not only by those practically engaged in this great branch of national industry and wealth, but by all who are desirous of becoming acquainted with the commercial resources and condition of the country. The task of doing all this, by no means an easy one, is undertaken by one well qualified to do it justice. Mr Bischoff's wits may be said, with all seriousness, to have gone a wool-gathering all his life. During the whole of a pretty long career, his attention, he tells us, has been given to wool and the woollen manufactures. Born and brought up at Leeds, the great mart of these trades, his earliest mercantile pursuits were devoted to them; he took a lively interest in every measure likely to affect them; and, whenever questions were agitated, he took part respecting them. He thus became familiar with all who interested themselves in the subject; had access to the best information and most useful documents; and his work will, therefore, be found a most valuable repository of nearly all that is worth knowing in relation to this important matter. From the plan followed, it is virtually a compilation, but not without original matter, and the whole is skilfully arranged and digested. We can only, in this place, refer to a few points, which will, we hope, convey some notion of the manner in which the task is executed, and have the effect of inducing the reader to peruse the work itself.

Beginning with the creation of the world, the author furnishes us with much curious information regarding the most ancient manufactures and commerce. According to his learned correspondent, Professor Hurwitz, the first article of dress ever used

* "A Comprehensive History of the Woollen and Worsted Manufactures, and the Natural and Commercial History of Sheep, from the Earliest Records to the Present Time." By JAMES BISCHOFF, Esq. 2 vols. London: Smith, Elder, & Co. 1842

the *chagora* or belt, made of fig leaves, by our first parents, which hitherto has been erroneously translated, apron. The kind of dress made of wool was the *simla*, an upper garment mbling a blanket, which served as a covering by day and a by night. It is this that is alluded to in Exodus, xxii. 26, xii. 34. It frequently occurred to the author that the ndid colours, blue, purple, and scarlet, so often spoken of in tion to the decorations of the temple, could not apply to fine ı, because the full lustre of these hues cannot be imparted by ng to substances of vegetable origin. The learned pundit re alluded to confirms this opinion, alleging that the word for l must be understood as being the substance to which these urs apply—a speedy and arbitrary way, it must be admitted, eciding the question, but which, at the same time, other conrations render highly probable. It is very likely that the d of sheep known in the earliest times was the broad or fatd sheep, as that best accords with what can be gathered from pture respecting the original breed, of which a single tail was etimes offered on the altar. That breed is particularly ndant in the present day in Syria and Palestine, outnumberthe common Bedouin species. The tails are often one-fourth weight of the whole carcass.

he Europeans, no doubt, derived the art of manufacturing llens from Egypt or Western Asia; at what time it began to ractised in Britain is not very evident. Britain probably ained few or no sheep till some time after the Roman Cont; no mention is made of them till about the beginning of eighth century; and they could not be very numerous till a ral destruction of wolves took place, which happened about middle of the tenth century. In little more than two hunl years after that, in the reign of Richard I., they were so increased, that wool was become one of the capital commodiof the nation. No sooner did it become plentiful and valu than it fell a prey, first to arbitrary power, next to the spirit nonopoly, and it has been almost constantly subject to severe ositions, and never more so than from the Restoration downds. With the growth of wool in England, or very soon after, art of manufacturing it commenced, cloths being certainly le not only in but long before the year 1224; and, towards the e of the thirteenth century, one Thomas Cole was distinguished the name of the Rich Clothier of Reading, in Berkshire. One he greatest clothiers that England ever produced was also a ive of Berkshire, John Winchcomb, commonly called Jack of wbury. He kept about a hundred looms in his house, and, in expedition to Flodden Field against the Scots, marched a dred of his own men, all armed and clothed at his own expense.

"If we may be indulged a conjecture," says Smith, in hi "Memoirs of Wool," "touching the origin of wool-sacks in the House of Lords, as a notable memorial of great consequence, we should imagine it to have been, if at all, some time during thi struggle, (namely, the resistance of the people to Edward I. levy-ing, by his own authority, forty shillings on every sack of woo exported,) to perpetuate the remembrance of the noble stan made on that occasion, and of an allowed indefeasable right i the subject not to be saddled with any tax or imposition by othe authority than that of Parliament."

The state of woollen manufactures in Scotland about the yea 1705, appears to have been as follows:—"They made of their ow wool, stockings, at Aberdeen, from ten to thirty shillings a-pair broad cloth, about twelve shillings per yard; fingrins, bays serges, temmins, and all sorts of fine worsted camlets, and othe stuffs, very near as good as in England; besides Glasgow playd in which, as well as stockings, they excelled greatly all othe nations."—Vol. i., p. 93.

About the year 1752, great complaints were made by the woo staplers of the evil done to the fleece by the practice of brandin sheep with pitch and tar, and also of the false and fraudule binding of the fleece, in which it was the custom, for the purpo of increasing the weight, not only to include the worst kind the wool, such as tail-wool, shank-locks, coated-wool, &c., b also clay, stones, sand, dung, &c. To lessen the former of the evils, it was recommended—and the recommendation is wort of being attended to in the present day—1*st*, To confine all bran to the buttocks or hinder legs; 2*d*, To limit the size of the brand 3*d*, To prohibit the use of pitch and tar to all other marki thought proper to be put on sheep.

The golden fleece has been often sung by the bards of ant quity; the task of celebrating the great staple of Britain a Ireland has been undertaken by John Dyer, LL.B., and h poem, entitled "The Fleece," was published in 1757. The di ferent kinds of sheep, and the pasture best fitted for them, t sorting of the wool, modes of manufacture, description of some the machines, &c., are the topics which inspire his muse. N is she not inspired, even on such subjects as the spinning-jenn as might be demonstrated did our space allow. The advantag of England over others as a sheep-rearing country are th noticed:—

On spacious airy downs and gentle hills,
With grass and thyme o'erspread, and clover wild,
Where smiling Phœbus tempers every breeze,
The fairest flocks rejoice.
—— No fleeces wave in torrid climes,
Which verdure boast of trees and shrubs alone—

Shrubs aromatic, coffee wild, or tea,
Nutmegs, or cinnamon, or firey clove,
Unapt to feed the fleece. The food of wool
Is grass or herbage soft, that ever bloom
In temperate air, in the delicious downs
Of Albion, on the banks of all her streams.

great anxiety and personal exertions made by George III. rease the value of English wool, are well known. In 1786 ceeded, by using great interest, in importing a few Merinos Spain; and six years afterwards he obtained an additional of five rams and thirty-five ewes of the very best class, the te breed, for which he gave in exchange eight fine English horses. The flock was entrusted to the charge of Sir h Banks, who selected the park at Oatlands for their pas- and admitted of no crossing whatever. For the wool of sheep, two shillings per pound and two-and-sixpence per above the ordinary prices were obtained in 1796 and 1797. oyal flock increased rapidly, and some of the sheep were uted amongst agriculturists thought most likely to attend purity of the breed; and, still further to attract attention m, part of the flock was sold by public auction in 1804. y be interesting to state a few of the prices given on that e occasion:—

Lot.	Weight of Fleece. lbs. oz.	Price. £ s. d	Purchasers.
8	5 4	31 10 0	J. W. Allen, Esq.
9	3 12	31 10 0	Mr Knowles.
12	5 4	28 17 0	G. H. Sumner.
27	7 8	39 18 0	Mr Jefferson.
35	—	7 7 0	Mr Freeman.
45	—	6 6 0	Mr Hallett.

Majesty had never before sold a Merino sheep for more than ineas, so that the anxiety to obtain possession of them y exceeded his expectations.

en we consider the immense multitude of sheep now reared stralia, and the comparatively short period in which this se has been effected, it is interesting to look back at the eginnings of a branch of colonial husbandry which now es so many of our countrymen. Captain Macarthur claims edit of first introducing sheep into Australia in 1801; but ears, from Lieutenant-Governor Collin's "Account of New Wales," published in 1804, that they existed long before eriod. In 1788, it is stated, the Governor had the morti- n to learn that five ewes and a lamb had been destroyed at by the dogs of the natives, a disaster which, to the rs of a new colony, was of sufficient magnitude to be d a public calamity. In the year mentioned, there were colony 29 sheep; in 1792, 105; in the following year, 526; 6, 1531; in 1800, 6124; in 1803, 10,157.

t climate and the nature of the pasture should have a

material effect on the texture and quality of wool, we can rea understand; but it is not easy to conceive how the soil can af the colour. Yet we are informed, by Mr Bakewell, that in p of Gloucestershire the fleece acquires a deep orange colour fr the soil; in Hertfordshire and Warwickshire, and in every trict having a red-coloured soil, the wool is inclined to a browni red; the fens of Lincolnshire and Cambridgeshire communic a dark bluish tint to the wool; wools on chalky soils are tinguished by their whiteness; and in every district the actio the soil is evinced by communicating the colour to the fle either by insinuating its particles into the fleece and its fibres chemically uniting with the surface. The colour thus acqui is alleged to be as indelibly fixed in the wool as the colour matter of an artificial dye; nor can its whiteness be perfe restored by any process of art hitherto known. We do think that this will accord with the general experience of w growers, and apprehend that Mr Bakewell has erred by gene izing from too limited a number of facts, and these dependent local and accidental causes. But if this alleged fact occurs in case, it is certainly a curious one, and deserving of investigati

Stockings, (says Mr Bischoff,) in the time of Henry VIII. were made of pi of cloth sewed together. Knitting was introduced, it is supposed, from Spain, in time of Queen Elizabeth, by Wm. Rider, in 1564. The frame or machine weaving stockings is attributed by some to W. Lee, M.A., of St John's Coll Cambridge, about the year 1589. Others have given the credit of the inventio a student at Oxford, at a much later date. Aaron Hill, in his "Account of Rise and Progress of the Beech Oil Invention," printed in 1715, says that "a dent at Oxford was driven to it by dire necessity. This young man falling in with an innkeeper's daughter, married her, though she had not a penny, and h his marriage, lost his fellowship. They soon fell into extreme poverty, and t marriage produced the consequences naturally to be expected from it; the amo pair became miserable, not so much on account of their sufferings, as from melancholy dread of what would become of their yet unborn infant. Their means of support was the knitting of stockings, at which the woman was expert. But sitting constantly together from morning to night, and the sc often fixing his eyes with steadfast observation on the motion of his wife's finge the dexterous management of her needles, he took it into his imagination that it not impossible to contrive a little loom which might do the work with more ex tion. This thought he communicated to his wife, and joining his head to her h the endeavour succeeded to their wish. Thus the ingenious stocking-loom, whi so common now, was first invented, by which he not only made himself and his fa happy, but left his nation indebted to him."

These volumes include a description of the various races sheep, occurring not only in this country, but in different quar of the world; a subject on which we shall not offer any rema in this place, as it is intended to take it up separately i future number.

Naturalists' Library—British Birds, 4 vols., *British Fis* 2 vols.—As the publication of this work advanced, we occas ally directed the attention of our readers to such portions o ... suited from the nature of the subject, to occupy a pl

in our pages. Now that the work is completed, we are desirous to notice, in a similar way, the volumes referring to the two above-mentioned departments of natural history, neither of which can well be matters of indifference to those residing in the country, and continually encountering, in so many different ways, the objects of which they treat. Birds are constantly attracting our attention, and, by their many singular proceedings, soliciting us, as it were, by provoking our curiosity, to the investigation of their ways and instincts. Their forms and colours, their notes, their migrations, their loves and enmities, their nests, their eggs—in a word, the whole economy of their lives, offer interesting subjects of observation. There are, besides, other considerations from which they should claim the notice of the agriculturist: they are not unfrequently the cause of injury to his crops, and not unfrequently also of benefit to them. Indeed, if we could estimate the precise amount of damage and benefit arising from birds, we believe the balance would be found to be very nearly adjusted. Without entering into the much-vexed rook question, the merits of which may be considered as still pending, although there can be little doubt that the bird in question has been more sinned against than sinning, there seems every reason to suppose that the occasional injury the feathered tribes commit, by pilfering seeds and grain, is fully counterbalanced by their services in ridding us of noxious slugs and insects, including, under the latter term, caterpillars, grubs, maggots, and a host of similar plant-destroyers. And if the balance be nearly equal when considered in this light, how much does it preponderate in their favour when we add the many considerations which recommend them to our regard!

There is one point of view, indeed, in which our native birds do not contribute to our enjoyment so largely as might at first sight be expected, that, namely, which regards them in the interesting light of things to be eaten. They are better fitted to ornament and enliven our fields and gardens than to grace the shelves of a larder; and however important they appear in the voluminous catalogues of Yarrell, Selby, Jardine, and Macgillivray, they cut but a poor figure in the pages of Meg Dodds. How few of them form any part of the valued population of the barn-yard! Pigeons, geese, and ducks, form the whole contribution; and even the native game-birds of any value are comparatively few in number. The grouse, the most national and characteristic of all our birds, from being exclusively confined to the British islands, and, at the same time, *the only one peculiar to them;* the black-cock, ptarmigan, partridge, and two or three others of smaller note, are all worth mentioning. For by far the greatest part of our most valuable poultry we are

indebted to Asia,* as we likewise are for the majority of our other domesticated animals.

Notwithstanding the immense flocks of marine piscivorous birds which frequent our rocky and indented shores, we are not aware that any endeavour has yet been made to derive any advantage from them, of a kind similar to that afforded by the bird which deposits guano. It is singular enough that we should be still unacquainted with the precise characters of the last-mentioned sea-fowl, and cannot assign it its proper place in an ornithological system, although voyagers are said to shoot many of them, and even to have assisted, in so doing, to drive them from the Moro of Arica, which they once frequented in great numbers. They are described as having a bill three or four inches in length, and about one inch broad at the extremity, much curved and well adapted for hooking up fish, which they seize with much adroitness. But even although the guano-bird differs materially in external appearance from any frequenting our coasts, there can be little doubt that, owing to the similarity of the food, the qualities of the dung must also be similar. Considerable accumulations of the latter must exist on many of the small islets and rocky promontaries which are so abundant on the western coasts of Scotland. We are aware it is usually alleged that, in our moist climate, the dung of sea-fowls is liable to be washed away by the rains, and that, even when it is not so, its good qualities are likely to be impaired by exposure to the latter. There is, doubtless, much truth, in this assertion; but we cannot help thinking that, in some localities, enough will still remain, and that of sufficiently good quality, amply to repay the trouble of collection. The inhabitants of the more remote islands, St Kilda, for example, have scarcely anything to occupy their time when not engaged in fishing, and it is very likely that they could easily collect considerable quantities of this substance, if they

* The whole of the magnificent tribe of pheasants, using that word in its most extensive and *Linnæan* acceptation, as including peacocks and the galli, it is scarcely necessary to remark, is exclusively Asiatic. From a notice which lately appeared in the public prints, it appears that some valuable kinds, both of galli and true pheasants, have recently been reared in the Royal Aviary at Windsor. Some Cochin China pullets are described to be of such a size that they can eat from a table three feet high, and a couple of them weigh from twenty-two to twenty-three pounds. The eggs, which are laid in some plenty, are said to be of a mahogany colour, finely flavoured, and highly prized by the Queen. Can this be the *Gallus giganteus*, or some other species with which naturalists are yet unacquainted? If its merits are such as described, it would be highly desirable that it were bred in numbers, and distributed through the country, an object which, if convinced of its utility, we are satisfied the authorities at Windsor would willingly lend themselves to. It would be gratifying to have a more particular account of the gallinaceous birds in the Royal collection; that above referred to is unsatisfactory from its brevity, and probably inaccurate.

are aware of its importance, and had once their attention rected to the subject.

To any one desirous of becoming acquainted with our native rds, the four volumes of the "Naturalists' Library" will form an ccellent and interesting guide. Without going too much into tails, but presenting, at the same time, all that is essential and portant, the subject has been brought within a moderate space, d presented in a readily intelligible form. A large proportion 'the species are figured, and, in the great majority of instances, an exceedingly beautiful manner, whether we regard the sign, engraving, or colouring. In this, the most recent catague of our feathered population, the amount is represented as ry considerable; but no small proportion of these are only usual visiters, and of several only single specimens have ocrred. Although wild swans are so seldom seen, we have no wer than four of these stately birds, and they may be readily istinguished, notwithstanding the similarity of their form and lumage, by noticing the difference of the bill and head. The ute or tame swan, (*Cygnus olar*,) the kind chiefly known as an rnament to our rivers and artificial waters, has the nail, base, pace between the eye, and tubercle or knob black, the other arts of the bill reddish-orange. In the Polish swan, (*C. immutbilis*,) a large species, which sometimes visits this country, and markable from the circumstance of the plumage continuing ure-white at all ages, the bill is likewise reddish-orange, with he nail, lateral margins, base, and the space to the eye, black. 'he bill of the Hooper, (*C. ferus*,) the kind of swan most freuently seen wild in this country, is orange-yellow at the base, hat colour extending forward on the edges of the mandible, the pical portion black. Bewick's swan (*C. Bewickii*) has the greater art of the terminal portion of the bill black, the orange at the ase assuming nearly the form of an oval spot carried out to he eye. These simple characters will enable any one to deternine what species he may fall in with, and the occurrence of the econd and last mentioned should always be noted as a fact of nterest to the ornithologist.

But into details of this description we cannot here enter, and onclude by repeating our recommendation of this work as at nce a cheap, accurate, and interesting history of our native birds.

Of the volumes on fishes we can speak in terms of equal comnendation. A compendious summary of British fishes was a work ery much wanted. It is only of late that the list could be egarded as anything like complete, but it may now be considered s pretty nearly so. Our acquaintance with the habits or natural istory of our native fishes was long most imperfect, and, indeed, t may be said that it continues to a certain extent to be so still. This almost necessarily arises from the extreme difficulty of

observing their manners, owing to the element they inhabit. Recent experiments have, however, shewn that the obstacles thence arising, great as they are, can, to a considerable extent, be overcome; and now that the right path of investigation has been entered upon, it is to be hoped that it will be pursued till it lead to satisfactory results. The number of fishes here enumerated as British amounts to 253; but the claims of not a few of them to be so accounted are not very strong. A succinct account of their localities, times of appearance, breeding, and general habits as far as known, is here supplied; and the whole literary portion of these two volumes has evidently been the subject of much care. The figures by which a large proportion of the species are represented are also praiseworthy—highly so, indeed, with regard to the drawing and engraving: if the colouring is not in every instance such as might be desiderated, we must think of the difficulty of the subject The tinting of few natural objects is more exquisite than that of the finny race; it is, at the same time, as versatile as it is transcendent; and if we view them either in a fresh state, or when they, in their natural element,

——————— sporting with quick glance,
Shew to the sun their waved coats dropt with gold,

we shall not feel surprised that they set at defiance all the skill of the limner's art.

Lancashire Farming. By LAWRENCE RAWSTORNE, Esq.*—Those who are familiar with the state of farming in the best cultivated districts of Scotland, never fail to be struck with the painful contrast presented in this respect by many parts of England. That this should have been the case a considerable number of years ago is not so much matter of surprise; because the sister country was then almost exclusively occupied in extending or preserving her commerce: but now that she may be almost said to have gained possession of every available point as an outlet for her commodities, and must limit her exertions because the world, extensive as it is, is not boundless, it is matter of surprise as well as regret that so little effort is made to develope her internal resources. This remark, of course, applies only to some parts of the country, and to certain of these more forcibly than others; and it will in general be found, as a result of very obvious causes, that those counties most distinguished for manufactures are farthest behind in agriculture. Take Lancashire, one of the greatest manufacturing districts of the country, as an example. Mr Rawstorne affirms that, throughout the whole county, there is not perhaps one really good grass field to be

* "Some Remarks on Lancashire Farming, and on various Subjects connected with the Agriculture of the County; with a few Suggestions for Remedying some of its Defects." By LAW. RAWSTORNE, Esq. London: Longman & Co. 1843.

found; that $2\frac{3}{4}$ quarters of wheat per acre is considered a fair crop; that the average rental does not exceed 30s. per statute acre; the stock are generally allowed to range abroad in the fields the whole winter; it is not uncommon to grow what were called *blendings*—a compound of a few beans, a sprinkling of pease, more vetches, still more weeds, and all sorts of rubbish, &c. With these pitiable results before us, we are told, at the same time, that the soil of Lancashire, generally speaking, is excellent; the marshes, which are an alluvial collection, are rich to a degree capable of producing the finest wheat, and the loam, being deep as well as rich, brings to perfection turnips, potatoes, clover, mangel-würzel, and even carrots. The causes which have led to this neglect of the agricultural capabilities of this county, are, as has been hinted, by no means difficult to discover. Minds occupied with trade and manufactures, habituated to the excitement arising from their ceaseless fluctuations, and ever lured forward by the prospect of successful speculation, are very unlikely to be diverted into the sober, regular, and comparatively hazardless path of agriculture. Indeed they are apt, in such a case, not only to undervalue but even to conceive a contempt for it; and the allurements often presented to the rural population by the temporary, though for the time overwhelming, prosperity of manufactures, has been one of the principal causes of the defective cultivation of this county. At the time when weaving was at the highest price, we are informed by Mr Rawstorne, it was introduced into the different farm-houses, when all other considerations gave way to it. A good hand-loom weaver would then earn his 30s. a-week, or even more; he would perhaps work one-half of the week and drink the remainder. Farms by these means became subdivided; cottages were built; a large shop was attached to every building. The houses, both of the farmers and cottagers, were occupied by as large families as could be procured, and these paid an enormous rent from the profits of the loom.—(Page 22.) These and other circumstances led to the neglect of agriculture, and as wheat was selling, during the war, at £6 the quarter, the land was utterly exhausted in the anxiety to rear it. But these causes no longer operating to the same extent, the marvel is that proprietors should be so blind or so indifferent to their own interests as not to make a greater effort to render their estates productive. To bring about this desirable result, we consider such publications as that referred to above to be possessed of considerable value, if executed in a comprehensive manner, and with an extensive knowledge of what constitutes good husbandry. By confining the attention to a comparatively limited district, all the local peculiarities can be more easily detected and examined, and the specialities of treatment

adapted to their case more effectually pointed out. If the knowledge which such publications afford were more generally accessible, we are persuaded that one of the first consequences to ensue would be the introduction of a more *uniform* system of culture. It is astonishing how much the practice differs in different counties, of England especially, and even of Scotland. Now there can be little doubt that some one of the systems in use is preferable to the rest, and we presume the superiority, as far as relates to rearing corn, is generally conceded to what, for want of a better term, may be called the Lothian system. There are few parts of the empire so peculiar as not to admit, to a greater or less extent, of the application of this system, at least in its essential attributes; and it surely ought to be a great advantage to those defective in agricultural knowledge to have a model thus set before them after which they may work. And if tenants are prevented doing so effectually by the nature of their tenure, would it not be of advantage to landlords to give them all facilities for what would increase, in many instances, so largely the amount of their income?

An excellent example of the mode in which land in Lancashire may be improved, is afforded by what has been done on the Lytham property. Among other improvements, a better system of leasing has been adopted. The usual term is seven years, but, in the instance referred to, that has been extended to nineteen, and thus substantial and intelligent farmers from Scotland have been induced to enter upon farms of about 250 acres each, and are actively engaged in bringing about an ameliorating system.

Our author mentions a custom, supposed peculiar to the county of Lancashire, of what was called letting farms by ticket. The excitement usual on such occasions, where numerous competitors entered the field to attain a desired object, was still farther increased by copious potations of stimulating liquors, with a large infusion of ardent spirits. The offers made being written on a slip of loose paper, and not publicly announced, were kept a profound secret; the different antagonists went on bidding against each other, and, as three chances were given to each, they often bid against themselves. The successful candidate was then declared, frequently at a figure out of all reason, and far beyond the fair value of the farm.—(P. 24.)

Mr Gregg expresses his conviction that the agricultural produce of Lancashire and Cheshire might be *tripled*, and there is every reason to believe that this estimate is not overcharged. Mr Rawstorne has pointed out, in regard to the former county, some of the means which might tend to accomplish this. There is much to be desiderated in such a work as his, on which he has not touched and much which he has touched which would require

be treated with more precision and detail, to be extensively useful; but it is not a work of pretension, and professedly elementary; it may safely be affirmed of it, however, that all that is said is in the right direction, and the object and execution are alike praiseworthy.

*Whitley's Geological Agriculture.**—The sciences were tardy in coming to the aid of agriculture; she was long left to struggle almost single-handed; but they now promise fairly to compensate for former neglect, and, as is not unusual in such cases, have perhaps inspired hopes which they cannot fully realize. There is little doubt, however, but that they can effect improvements of a most important kind, and the more speedily they can be brought into operation the better will it be for the general good. The work referred to above, and that noticed immediately after it, relate to two branches of science which are calculated to confer most benefit on agriculture—viz. Geology and Chemistry. The former affords a valuable auxiliary in enabling the agriculturist to form a correct knowledge of the origin and character of the various soils; the causes of their diversities, which are often very sudden and remarkable; the nature and origin of subsoils; and many even supply useful suggestions in draining, and other matters with which at first sight it does not appear to have any immediate connection. The utility of the science forced itself on the notice of the author of this little volume in his capacity of a landsurveyor, for which it affords most valuable aids; and he became anxious to make its principles, and the mode of applying them practically, known to others circumstanced like himself, as well as to general readers. He has executed his task with great care; and his work, which is very neatly and accurately written, will be found very useful to those who wish to make themselves acquainted with the more elementary parts of the subject. His field of observation appears to have been chiefly Cornwall, with the geology of which, and its application to agriculture, we had already many excellent sources of information, in Sir Henry de la Beche's "Geological Report on Cornwall and Devon," Dr Boase's "Contributions towards a Knowledge of the Geology of Cornwall," and other valuable works. He does not, therefore, supply us with much that is original, but digests and applies to his purpose the information given by others. The facts which he thinks he has established

* "The Application of Geology to Agriculture, and to the Improvement and Valuation of Land; with the Nature and Properties of Soils, and the Principles of Cultivation." By NICHOLAS WHITLEY, Landsurveyor. London: Longman & Co. 1843.

are the four following:—1*st*, That geology offers to the prac tical agriculturist essential aid in affording the means of defi nitely describing and classifying the various soils, thereby enablin him to apply to the land he cultivates those means of improve ment found by experience to be suitable to any particular soil 2*d*, That geology enables us to infer, from the mineral constitu ents of the parent rock, the chemical composition of the soil, an hence to select such plants as may be most adapted to it. 3*d*, Tha geology points out the causes of fertility or unproductivenes with the manure generally adapted to any particular soil, and th means by which waste land may be most effectually reclaime 4*th*, That geology is of essential importance to the land-value not only furnishing him with the information stated above, bu enabling him to distinguish the temporary fertility or exhaustio of land from its natural productiveness, and supplying him wit data from whence he may estimate, with some degree of certaint the value of the unexplored mineral wealth.

We are apprehensive that our author, in advocating the clain of his favourite science, has advanced them, as so often happe in similar cases, somewhat beyond their legitimate boundar Geology, it is said, points out the causes of fertility or unprodu tiveness. Now, properly speaking, it merely enables us to dete mine what is the origin of particular soils and the probable re sons of their occupying particular localities; the causes of the fertility or barrenness we must learn from other sources. B when it is stated that geology enables us to judge of the manu adapted to any particular soil, the chemist will immediately me him with *suum cuique*, and justly complain of an encroachme upon his territory. It is very obvious that the earthy matter all soils must be derived from the disintegration of rocks. If soi continued to occupy the place of their original formation, acquaintance with the rocks would, therefore, enable us at on to judge of the composition of the soil; but soils have been tran ported and intermixed in such an endless variety of ways, bo by natural and artificial means, that there is, in a vast number cases, no connection whatever, in regard either to mineralogic characters or chemical composition, between them and the roc on which they now happen to rest. This is the case with nea all alluvial deposits, and a great proportion of the most profital lands now under culture. In nearly all the flat portions of t country round Edinburgh, for example, belonging to the co formation, the soil has no relation whatever to the subjace rocks. These considerations are restrictive, therefore, of t utility of the study of rocks as a means of becoming acquaint with the character of the soil. But in primitive districts, a the ... where no great separation has taken place, one famili

with the different rocks and geological formations may tell the origin and predominating character of a soil even by observing it from a distance, and judging by its colour; thus on the chalk, the soil is white; on the red-sandstone, and some kinds of porphyry, red; and on the clay-slate, of a kind of yellowish hue.

We make the two following short extracts from Mr Whitley's work, as containing statements which seem deserving of attention:—

All organic manures act by yielding carbonic acid and nitrogen in the form of ammonia, and their relative value is nearly in proportion to the quantity of nitrogen which they contain. Animal substances contain a large quantity of nitrogen; whilst only small portions of it exist in vegetables. The flesh of horses and other animals not used for food can occasionally be obtained, and when these are mixed with a large quantity of earth, and suffered to decay, they form a very rich and stimulating compost. The carcass of a horse is equal to, at least, *ten times* its weight of farm-yard manure, and would prove much more valuable to the farmer if converted into a compost than if sold for the kennel.—(P. 109.) When land is unproductive by reason of the climate in which it is situated, or from its height above the sea, it must be considered unreclaimable—the cause of its barrenness cannot be controlled by man. In some cases land may be improved by planting; and near the sea, where it is subject to high winds, the tamarisk, (*Tamarix gallica*,) planted on the hedges, forms an admirable shelter; in seven years it will grow from ten to twelve feet in height, and feathered to the very bottom. It delights in a sandy soil near the sea, but will not stand the frost."—(P. 123.)

We fear that the last mentioned circumstance neutralizes all its good qualities, considered in relation to our climate.

*Liebig's Familiar Letters on Chemistry.**—The name of Professor Liebig has been for some time familiar to all who direct their attention, however casually, to agricultural or scientific literature. The publication of his Organic Chemistry may be said to have constituted a new and important era in the history of vegetable physiology, while his Animal Chemistry threw equal light on animal physiology and pathology. The present Familiar Letters treat of subjects which have already been, or will hereafter be, more fully discussed in his larger works. They are intended to be mere sketches, written for the purpose of drawing public attention to the subject, and securing for it more effectual patronage and support. They place before us many of the most important results of chemical research, as bearing on the practical acts of life, and are written in a striking and animated style. The following extracts will be read with interest, and will probably induce the reader to have recourse to the little volume itself which is full of others equally striking:—

Of all the achievements of inorganic chemistry, the artificial formation of *Lapis*

* "Familiar Letters on Chemistry, and its Relation to Commerce, Physiology, and Agriculture." By JUSTUS LIEBIG, M.D. Edited by John Gardner, M.D. London: Taylor & Walton. 1843.

lazuli was the most brilliant and the most conclusive. This mineral, as presented to us by nature, is calculated powerfully to arrest our attention by its beautiful azure-blue colour, its remaining unchanged by exposure to air or fire, and furnishing us with a most valuable pigment, ultramarine, more precious than gold!

The analysis of *Lapis lazuli* represented it to be composed of silica, alumina, and soda—three colourless bodies—with sulphur, and a trace of iron. Nothing could be discovered in it of the nature of a pigment, nothing to which its blue colour could be referred, the cause of which was searched for in vain. It might, therefore, have been supposed that analysis was here altogether at fault, and that, at any rate, its artificial production must be impossible. Nevertheless, this has been accomplished, and simply by combining in the proper proportions, as determined by analysis, silica, alumina, soda, iron, and sulphur. Thousands of pounds weight are now manufactured from these ingredients, and this artificial ultramarine is as beautiful as the natural, while for the price of a single ounce of the latter we may obtain many pounds of the former.—(P. 8.)

He expresses his belief that there is not the remotest ground to suppose that any one of those substances which chemists regard as elements can be converted into another; and adds—

Mr Brown of Edinburgh thought he had converted iron into rhodium, and carbon or paracyanogen into silicon. His paper upon this subject was published in the "Transactions of the Royal Society of Edinburgh," and contained internal evidence, without a repetition of his experiments, that he was totally unacquainted with the principles of chemical analysis. But his experiments have been carefully repeated by qualified persons, and they have completely proved his ignorance: *his* rhodium is iron, and *his* silicon an impure incombustible coal.—(P. 55.)

To restore the disturbed equilibrium of constitution of the soil—to fertilise her fields—England requires an enormous supply of animal excrements; and it must, therefore, excite considerable interest to learn that she possesses beneath her soil beds of fossil *guano*, strata of animal excrements, in a state which will probably allow of their being employed as a manure at a very small expense. The coprolithes discovered by Dr Buckland, (a discovery of the highest interest to geology,) are these excrements; and it seems extremely probable that in these strata England possesses the means of supplying the place of recent bones, and therefore the principal conditions of improving agriculture—of restoring and exalting the fertility of her fields.

In the autumn of 1842, Dr Buckland pointed out to me a bed of coprolithes in the neighbourhood of Clifton, from half to one foot thick, inclosed in a limestone formation, extending as a brown stripe in the rocks for miles along the banks of the Severn. The limestone marl of Lyme Regis consists, for the most part, of one-fourth part of fossil excrements and bones. The same are abundant in the lias of Bath, Eastern and Broadway Hill, near Eversham. Dr Buckland mentions beds, several miles in extent, the substance of which consists, in many places, of a fourth part of coprolithes.

Pieces of the limestone rock of Clifton, near Bristol, which is rich in coprolithes and organic remains, fragments of bones, teeth, &c., were subjected to analysis, and were found to contain above eighteen per cent. of phosphate of lime. If this limestone is burned, and brought in that state to the fields, it must be a perfect substitute for bones, the efficacy of which as a manure does not depend, as has been generally but erroneously supposed, upon the nitrogenized matter which they contain, but on their phosphate of lime.

The *osseous breccia* found in many parts of England, deserves especial attention, and it is highly probable that, in a short time, it will become an important article of commerce.

What a curious and interesting subject for contemplation! In the remains of an extinct *animal* world, England is to find the means of increasing her wealth in agricultural produce, as she has already found the great support of her manufacturing industry in fossil fuel—the preserved materials of primeval forests, the remains of a *vegetable* world. May the expectation be realized! and may her excellent population be thus redeemed from poverty and misery!—(Pp. 176–178.)

*The Emigrant to North America.**—The design of this little work is a most laudable one; and we are glad to learn, from the advertisement prefixed to it, that, although this is the first time it has been printed in this country, two large editions have, during the last two years, been disposed of in America. The author's object is to convey to the intending emigrant some idea of the most important nature of the step he meditates, and to furnish him with hints for his future guidance, should it be resolved on. Hitherto there has been a great want of some guide-book, containing, in a concise form, some plain and practical information regarding the general features of the North American provinces, their climate, soil, and agricultural capabilities, their internal communications, and the best mode of reducing the mighty forests, which overspread them, to the mastery of the plough: in fact, to give an epitome of a settler's life in the Canadian wilderness. The germ of the work first appeared in a series of papers in the *Quebec Mercury*, which attracted much notice, and were copied into several other journals. They were then collected into the form of a pamphlet, which met with a ready sale, and was a second time reprinted in the spring of 1843. The edition now before us is much extended, and contains a great variety of additional information. We understand that the character of this little work, throughout the colony of which it treats, is very great; and that it has been productive of great benefits to those for whose use it was intended. Indeed, so much was this felt to be the case, that we are told that the late Governor-General, Sir Charles Bagot, as well as the present one, Sir Charles Metcalfe, have taken great pains as to its gratuitous distribution, both in this country and in Canada, from a conviction of its great importance to the emigrant. The author sets out with the assurance to his reader that his work is the result simply of personal experience; that he has not, nor ever had, any connection whatever with any of the colonial land companies or emigration associations, as such a supposition might be supposed to have an influence over his opinions; and that his sole object is to convey useful information to those whose intentions are to settle in a strange land.

In the first part of his book, our author states the fact, that intending emigrants generally ransack the libraries for everything published regarding America, in the shape of histories, recollections, travels, conversations, emigrants' guides, and letters to friends—that he had done the same, but found in the

* "The Emigrant to North America, from Memoranda of a Settler in Canada." By an Emigrant Farmer of Twenty Years' Experience. 12mo, pp. 120. Blackwood: Edinburgh and London. 1843.

reality very little to correspond with the description, and that what the pen of the enthusiast had made like the garden of Eden was, in truth, but a wild and interminable forest.

Having, with his brothers, resolved on leaving his native country, the paternal inheritance was divided amongst them, and the share of each was £300. The eldest was set out as a pioneer, and sailed to Nova Scotia; and if he did not like that, he was to proceed to Canada. The former province he did not like; and, after a sail from thence, in ten days he reached Quebec. There, also, his expectations were disappointed, and he proceeded to Upper Canada. The florid descriptions of Mr Birkbeck led him to the Ohio country; and, as appearances seemed to brighten, he wrote home to his brothers to join him at Philadelphia. Only one of the remaining brothers acceded to this proposal; and the youngest, with our author, sailed for Canada in the spring of 1818. Having no notion as to what would be suitable for the American market, they took out their money in gold and bills of exchange. Both parties reached their destinations in safety.

Having arrived at Montreal, our traveller put his money, which had suffered but a trifling diminution in 180 miles journey from Quebec, into the bank, at five per cent. interest, and immediately sought out the locations made by the English. After travelling about forty miles through the intricate mazes of the crooked American roads, he reached the settlement he was in search of. It being too late in the season to commence upon land of his own, he chose rather to attach himself to the family of a substantial farmer, a native of the country, though a son of a British loyalist of the first American war. He did not actually hire himself as a labourer, but, by making himself useful, he was to pay nothing for his board. The bargain he afterwards thought imprudent, but lost nothing by it, as he received as much in stock and seed-grain as he would have received had he stipulated for wages. Besides, he gained a knowledge and an experience to which he attributes all his future success.

In the spring following, he purchased in that neighbourhood a farm of 300 acres, about fifty of which were already cleared, with a log-hut for a dwelling-house, and a good frame-barn upon it. The price was £300—£100 to be paid at the time, and the remainder in annual instalments of £50, with interest, after the first year, of six per cent.—the highest legal rate. He now bought a yoke of oxen for £15, or sixty dollars, three cows for £15, four sheep for £5, and a horse for £17; several implements of husbandry, a little house-furniture, pigs, poultry, &c.

The emigrant spent the first summer in clearing three and

acres of woodland and putting up fences. The cleared as sown in September with wheat, and the rest of the was employed with late oats, potatoes, and Indian corn. hired a man, he then commenced to clear away the under- and when the snow came they turned themselves to felling rees, sawing them into pieces ten or twelve feet long, and hem up for fire-wood. By persevering in this manner, cres had, by the middle of April, been wrested from the besides several hundreds of rails cut, split, and hauled out bush, together with fire-wood for a twelvemonth. The ar's produce, however, was barely sufficient to pay its own s and keep the family till next harvest, it being necessary, tion, to buy some provisions.

n spring had come round, and all things began to look r traveller alone remained gloomy—only £50 of his money ft, and thrice that sum being still owing for his farm. rty acres were still so covered with fragments of half-con- wood, that the prospect of a crop from them looked very s, and, to add to his miseries, the rain fell in torrents for ght, soaking it so thoroughly, that its ever drying again scarcely to be calculated upon. His horse died; two of ep were ate up by wolves or bears; and, worse than all, a s old sow crunched up all the goslings. But with the ng sunshine his prospects brightened up; the ground dried han he expected; the remaining wood and leaves were now urned; twenty acres were planted with Indian corn, and h oats and spring wheat. The Indian corn was planted ly striking a hoe into the ground, raising it loaded with n dropping four or five grains into the hole, and replacing h upon it. These holes are made three or four feet apart, hing more is done till it is gathered in harvest. What ure could be more elementary?

farmer had got in his crops from the old cleared land, mmenced clearing for five acres of wheat, in which task ains of his last £50 were expended. His dependence on his next instalment of rent rested with some potash he de; and his turning his oxen in to feed, (after having s wheat in the beginning of September,) to make them he Montreal market by the latter end of winter—his rent ue in spring. His crops proved good; and his potash t a fair price. Everything prospered with him, and he e to purchase another yoke of oxen in time to get his fire- nd fencing-timber before the expiration of winter. He o other sources of gratification. The following passage urable alike to the head and heart of the author:—

We had a church and a Church of England clergyman in the settlement—not that every settlement has one, though few are destitute of the labours of a minister of some persuasion or other—and I would strenuously advise all well disposed emigrants not to overlook this circumstance in deciding upon their location; few there are, if any, who come to this country, having never been so situated as to be unable to attend the public worship of God, however negligent they may have been in availing themselves of the privilege, that would not feel most poignantly if they were deprived of the opportunity; nor would they see without some annoyance so little respect paid to that day set apart for relaxation and rest from the cares and labours of life, even admitting they forgot the nobler purpose for which it was intended, and to which it ought to be devoted, because it would at least be a constant witness to them, on its weekly return, that they were, if not houseless exiles, strangers in a strange land. Indeed, I have myself seen men, whom I knew to have seldom entered the precincts of the sanctuary, travel, what in England would be considered an incredible distance, upwards of twenty miles, to attend divine service, or perhaps to get their children baptized, or the clergyman to visit the sick of his family, or to "bury his dead out of his sight," consoling himself in his affliction with the idea, that there was one so near. It is in circumstances such as these that the heart of the exile yearns after his native land; he therefore ought to secure to himself, in the home of his adoption, as many of those favourable features in the home he has left as can possibly be found, and they will be to him as household gods; they bring with them associations that beguile into the tale of other years: and if they do not revive in our memory those scenes of pure and unmingled happiness in the bright and buoyant season of youth, they occasionally throw a transient halo of delight over our existence, by leading us to forget that we are away from them. Every emigrant may feel assured that, however anxious he may be to leave his native country, and however much it may be to his advantage to do so, he will retain a painful recollection of it to the latest hour of his existence. No one brought up in a country like England, where such order and regularity prevail, can form any idea of the demoralized state of society in many portions of the United States, whereas the part of the country where I had located myself might challenge the whole world for its superior in orderliness and morality.

The brothers, Henry and George, who had located themselves the one in Illinois and the other in the Ohio country, were by no means so fortunate; although their prospects had appeared so much more propitious in the outset, that they had each tried to induce our author to join them. James followed his fate in Upper Canada, and secured an independence.

After stating the advantages of a settler in Lower Canada with regard to taxation—there being no direct taxation, at least in so far as a settler is concerned—and the salaries of the clergy and of the schoolmasters being provided for from other sources and the indirect taxation amounting only to a moiety of what is paid by the inhabitants of almost any other country on the face of the earth—our author comes to treat of markets, and says that Montreal is assuredly the best on the whole continent of North America. Great numbers of people residing at more than hundreds of miles distant resort to it, from within the limits of the United States; while farm produce brings there a fair remunerating price, and necessaries required can be purchased cheaper than anywhere else beyond the Atlantic. Add to this, that the facilities of conveyance both by land and water, are extremel

ood; and that, if farm produce cannot be grown in Lower 'anada in such abundance *per acre* as in the warmer latitudes, et the expense is so much less, in consequence of the labour eing greatly cheaper, that the cultivator in that province, were e to pay for the tillage of an acre out of its own produce, would ave as much left, or nearly so, as the farmer in the Western States, after doing the same thing; while the price obtained for t would be three or four times as much in the former location as e could get for it in the latter.

As to climate, our emigrant maintains that the inconveniences rising from the length and severity of the winters in Lower Canada has been grossly over-stated. He admits that, looking t the thermometer and the depth of snow, the subject seems a ormidable one; but appositely remarks, that the state of our eelings and that of the thermometer do not always correspond —the perception of cold being much more owing to moisture than ntensity—a fact that all must have experienced. As to the now itself, he assures us that its continuance on the ground is onsidered there a great benefit to the farmer, as it acts as manure, and pulverizes the ground, superseding, in a great neasure, the necessity of fallowing. He affirms also that, in a wenty years' residence in Upper Canada, he has never seen or heard of a single instance of material suffering from cold, nd that, moreover, the length of the winter has been greatly xaggerated by tourists. "While now writing," he says, "this 9th November, my cattle are out grazing night and day, not yet aving had any snow, and scarcely any frost. I have sometimes ot been obliged to take them in, or to feed them, till a few days rom Christmas, though this is rarely the case; and by the niddle of April we commence sowing our grain, so that our winer is, on an average, not of more than four or five months duraion, instead of six or seven, as people have been led to suppose."

The second part of the emigrant's little book consists of the xperiences of his brother James, as narrated in letters from im, near Goderich, in Upper Canada; and more especially in a eries of graphic epistles from Robert Stevenson, "a plain pracical Scotsman, an Ayrshire emigrant," to his brother, a mechanic n Glasgow. These are curious, and full of excellent information; ut we can only advert to the part of them which relates to the resent state and prospects of the territory possessed by the Canada Company, under the management of Dr Dunlop.

According to a statement which the Doctor shewed Stevenson, he population of their track, which, in 1829, was unexplored, in 840 contained more than a population of 6,000; and the value the improvements and live stock amounted to £242,287. Of his large sum, £90,486 was acquired by families, 514 of which

had come into the province destitute; £10,242 by sixty-one families, whose means were under £10; £40,526, by 254 families, whose means were under £50; and £100,850 by parties whose means, though small, were over that amount. It is worthy of remembrance that this amount of human prosperity was in a great measure owing to the Company's following out the plans of that great and shamefully-neglected man, the late Mr Galt—a man whose genius has made him immortal, and whose philanthropical exertions deserve his name's being enshrined among the benefactors of his race.

The plans of the Company were eminently calculated to bring about the propitious result just stated, and have afforded a memorable example of the best way in which the wilderness can be opened up for human settlement—perhaps the only one in which this can be done within a reasonable period. Abundant employment was offered in making roads, and all were allowed to locate themselves on lands at the low price of a dollar and a-half per acre. No portion of the purchase-money was required in cash; and the result has been that, in ten years, 514 families, from their own labours alone, have made clearings and improvements on the land, and acquired stock worth £90,000—leaving altogether out of view the large sums paid on account of the purchase of ground—the properties themselves having, in many places, been quadrupled in value, and, in all, been doubled at least.

This principle was adhered to until all the lots abutting on the principal roads were occupied, when it was altered, and a first instalment of one-fifth of the purchase-money was required in cash; and, for this reason, that the demand for labour was then abundant, and every industrious man could easily manage to pay, from his savings, an instalment of ten or twelve pounds, besides having had an opportunity of acquiring the best mode of managing farm operations. The Company have, however, again returned to the old principle, which was found to work so well, so that poor people can now, as formerly, obtain a lease of lands for twelve years, on payment of a graduated annual rent, commencing at £2 per hundred acres, and increasing to £16 : 10s. on the twelfth year, at which time the lessee is entitled to a deed in fee-simple, and becomes a proprietor.

Such is a brief analysis of this little book, in so far as it relates to the state and prospects of the emigrants to Upper or Lower Canada—those of the last-mentioned province being from personal experience of our author; those of the former principally from that of his friends. It is delightful to think that both parties agree as to the comfort and prosperity to be obtained in either of these British colonies by the really industrious and well-doing settler

appendix contains a great deal of valuable information for nts, as to the best mode of laying out and employing capi- prices of cleared and uncleared farms, the expenses neces- r original outlay, and the best mode of conducting rural ons. Altogether these "Memoranda of a Settler in ι" are full of practical information, and are admirably by being published in such a cheap and compendious form, e an excellent manual for intending emigrants.

h's Scientific Register and Almanac for 1844.* Dedi- by permission to his Royal Highness Prince Albert.— iis little pocket volume, Mr Gutch has condensed a great f useful information gathered from every branch of science. ve scrutinized its pages most carefully, and have the plea- f being able to recommend it to the patronage of our , to all of whom it cannot prove otherwise than a most e companion to refer to for information on subjects for lay inquiry. That it is a very great improvement upon linary sort of pocket-books will readily be conceived, when te that it contains excellent chapters on agriculture, rules ulating the weight of cattle and of hay, hints on plant- l domestic economy; a table of manures, chemical tests, ening calendar, a list of fruits and vegetables that are ed in England, an article on geology, a table of the of the different metals and timbers, a table of the h of men and horses, a table of horse-power at different f speed, a table of the gestation of animals and of the ion of birds, a list of alimentary principles, a comparative nutritious foods, a table of the superficial extent of Eng- Vales, and Scotland, information on the value of property it Britain and Ireland, on the comparative duration of erinary prescriptions, a catalogue of useful facts, a table relative values of different kinds of coal, a comparative f the average quantity of rain falling annually in different f Great Britain, a table of the wind, a chart and nomen- of the clouds, natural indications of the weather, a table ing how far our climate varies one year from another, ie average number of frosty and hot days, receipts for various inks, cements, varnishes, waterproof composi- nixtures for cleaning furniture, harness blacking, and a d other matters. We have merely enumerated such of ents as can practically concern our own class of read- griculturists; but it is stored with a variety of subjects

* E. Lumley, 56, Chancery Lane, London.

to adapt it also to the wants of the naturalist, architect, chemist, astronomer, mechanic, &c. Besides this rich and various collection of useful information, it contains a very superior almanac. We feel assured that every man of practical science who provides himself with this little treasury of valuable facts, will have frequent reason to thank Mr Gutch for his well-directed and beneficial industry.

Prevention of Potato Failure. By Mr JAMES CAIRD, Baldoon, Wigton.—With the remarks in the last and preceding Quarterly Agricultural Reports, on the failure of the potato crop, I quite agree, and have experienced the propriety of the advice to plant unripened seed. My seed-potatoes last year (1842) were raised before they were perfectly ripe, and I have had no failure. Nearly all the seed I planted this year, however, was the small unsalable tubers planted whole, rejecting the very smallest. The crop was very healthly and productive. Indeed I have never seen a failure where small potatoes uncut are used for seed; and I believe this uniform success to arise from the *small* potato being unripe when taken from the ground. This opinion rests on the assumption that all the *small potatoes of a crop have not reached maturity when the rest of the crop is ripe*, as being the last formed. If this be so, it strengthens the common opinion that the less ripened potato of the upland districts makes the best seed. But at the same time we see how good seed may be had without the trouble or expense of a change from a late district, if we either plant the small potatoes of our own crops, or raise a portion for seed before they have reached maturity.

Experiments with Manures. By ROBERT MONTEITH, Esq. of Carstairs.—1. OAT CROP, 1843.—Part of a field manured with 267 lbs. of guano, at the cost of 31s. per imperial acre, produced per acre, ... 59 Bushels.

Manured with 10 bushels bone-dust, at the cost of 23s. 4d. per imperial acre, produced per acre, 43 do.

The difference may be stated as follows :—

Cost of guano,	31s.	produce,	59	bushels,	@ 2s. 6d.	£7	7	6
Cost of bones,	23s. 4d.	do.	43	do.	do.	5	7	6
	7s 8d.					£2	0	0
				Deduct difference of manure,		0	7	8
				Leaving in favour of guano,		£1	12	4

HAY CROP 1843.—To part of a field, manured the pre- year with farm-yard dung, was given 267 lbs. of guano per ial acre, at the cost of 31s., and the *extra produce*, per acre, 2 cwt. of hay, which, at 3s. per cwt., is £3 6 0
Deduct expense of guano, 1 11 0

Leaving in favour of guano, £1 15 0 p. acre.

8. WITH TURNIP, 1843.

	Description of Manure tried, and quantity per imperial acre.		Cost of Dung per acre.			Cost of other Manures per acre.			Total cost per acre.			Produce per imperial acre, stored Nov. 15 1843.	
e.			£	s.	d.	£	s.	d.	£	s.	d.	Tons.	Cwt.
		Guano 4 cwt.				2	8	0	2	8	0	11	8
	yds.												
	Dung 28,	Sulphate of Soda, 1 cwt.	5	12	0	0	4	0	5	16	0	9	8
	– 28,	Burned Bones, 6 cwt.	5	12	0	2	2	0	7	14	0	7	11
	– 28,	Bone-dust, 20 bushels.	5	12	0	2	6	8	7	18	8	7	2
	– 28,		5	12	0				5	12	0	4	19
	– 28,	Gypsum, 2½ cwt.	5	12	0	0	8	9	6	0	9	6	1
	– 28,	Guano, 4 cwt.	5	12	0	2	8	0	8	0	0	7	13
	– 28,	Beech-ashes, 48 bushels.	5	12	0	0	12	0	6	4	0	5	12
		Gypsum, 6 cwt.				1	1	0	1	1	0	a failure.	
		Bone-dust, 25 bushels.				4	3	4	4	3	4	9	6
		do. 12 bu. & 133 lb. guano.				2	14	3	2	14	3	11	15
		Guano, 356 lbs.				1	18	2	1	18	2	11	0
		Guano, 267 lbs.				1	8	7	1	8	7	10	15

vember 30, 1843.—The turnip crop on the field in which the e experiments were tried was fully one-third deficient in tity from crops generally grown on such land in this part e country, the soil being heavy and under medium quality. he turnip crops in this neighbourhood are, however, from hird to one-half deficient this season.

e Qualities which Distinguish or Characterise certain ilies or Orders of Plants. By J. MAIN, Brompton.—Ever the days of the wise King Solomon, many attempts have made by learned men to describe and arrange the vegetable lom systematically. For this purpose, many and various nes have been devised. Theophrastus, the disciple of otle, describes only about 500 plants; and which he dis- tes into seven divisions, characterised by their place of th, their size as trees or shrubs, their use as pot-herbs, escu- grain, and their lactescence. Long afterwards, Diascorides up a catalogue of all the plants of Greece and the surround- ountries, together with their known virtues and economical He added only about 100 names to those described by phrastus, and arranged the whole into four classes— ly, alimentary, aromatic, medicinal, and vinous.

About the sametime, several other authors flourished, namely, Antonius, Musa, Cato, Varro, Virgil, and Columella. The two last were eminent agricultural writers. Pliny the elder, in his natural history, brings together all the names of plants previously described, and arranged them as trees, shrubs, and herbs, embracing altogether above 1000 plants.

In the beginning of the sixteenth century many botanical authors appeared. Tragus was the most conspicuous, because the most industrious. In his history of plants, he divided the 800 species there described into three classes only, founded on the qualities of vegetables, their habits, figure, and size. Still there was no settled system. Gesner was the first who suggested a system which might be founded on the flowers and fruit; and though he published not any plan of his own, his idea was taken up by Dr Andrew Cœsalpinus, who sketched a system, having the fruit for its basis. This was really the first attempt at systematic botany, and from which all other subsequent systems may be said to have taken their rise.

In the course of time, botanical science was improved by the writings of many eminent men, namely, Rivinus, Morison, Bauhin, Gerrard, Parkinson, Bobart, and Tournefort; and, soon afterwards, by Ray, Sir Hans Sloane, Petiver, and Linnæus. The system of the last-named author was called the *sexual system*, because it was founded upon the male and female parts of the fructification. As such, from its extreme simplicity, it became exceedingly popular, and caused all former systems to be almost forgotten. But as Linnæus himself considered it imperfect, it being manifestly an artificial, not a natural system, succeeding botanists have been, and still are employed in endeavouring to discover a truly natural plan of arranging the vegetable kingdom, in order to facilitate the study of plants, and thereby gain a more intimate knowledge of their identities as of their properties.

It has been already observed that Linnæus was quite aware of the defects of the sexual system. He was candid enough to acknowledge that his system was imperfect; and, foreseeing that a more complete arrangement was yet in the womb of futurity, he bequeathed to posterity "fragments of a natural system." Of this bequest much good use has been made by a numerous band of botanists of the present day, among whom the late celebrated Jussieu stands prominent. He was the main projector of what is now called the *natural system*, and which it is probable is destined to supersede all other schemes of classification.

Neglecting the circumstances by which previous systematists had been guided, and who had considered only the visible forms, or sensible properties of plants, Jussieu dived deeper, and carefully examined the physical structure, from the difference of which

he was soon enabled to separate the whole vegetable kingdom into two grand divisions—namely, *cellulares* and *vasculares*, that is, plants composed of cells only; and, secondly, those built up not only of simple cells, but of cellular matter arranged into fibres, tubes, and various membranes. In the subdivisions of his system he adheres to the physical structure and stations of the various members, bringing the whole into classes and orders named from some leading peculiarity or most conspicuous plant of the order.

While Jussieu was thus employed in associating congenerous plants according to the principle adopted by himself, a new fact was elicited, namely, that his groups or orders were not only physically associable, but, moreover, congenerous in qualities. Consequently, poisonous plants were grouped together; and, with but few exceptions, sanatory genera or species were ranked under the same title.

This is doubtless one of the principal recommendations of the natural system; because this method of classification leads to a clearer knowledge of the specific virtues of plants when applied to the use of man, whether as food or medicine; and, moreover, renders the science of botany somewhat more than a mere mental accomplishment.

It was with the intention of advancing a few proofs of this important commendation of the now popular natural system that I took up my pen to lay them before the reader, who may not have directed his attention to this view of the science.

The first order in the natural system is *Ranunculaceæ*, so called from Ranunculus, or frogwort, many of the species inhabiting moist ground or watery places where frogs abound. They are chiefly herbaceous plants, bearing white or yellow, and some of them very gaudy, flowers. The clematis or traveller's-joy, so common in hedges in chalky soils, the anemone, and hellebore belong to this order; but the best type is the well-known butter-cup, so frequent in damp meadows, and which has the credit of giving the fine rich colour to butter; but this is a vulgar error, as cows seldom touch the plant, owing to its extreme bitterness. Indeed, acridity is the prevailing character of almost all the plants of this natural order, and in some of them exists in so great a degree as to blister the hands that touch them. The *R. scutatus* is a violent poison, and, except the water-crowfoot, all are more or less dangerous. One species called *R. arvensis* is a bad weed among corn, its seeds being difficult to get out of the sample; and, though cattle will eat it, such food is dangerous. *R. acris*, the butter-cup, so common in pastures, cannot be extirpated without much labour with the spade; but much may be done by mowing and clearing off the

flowering stems which are rejected by cattle. The splendid flowering peony belongs to this order, together with the columbines, larkspurs, and aconite. The flowers of all these are curious as well as beautiful, but still they are all similar in the quality of their juices. The aconites are among the most powerful vegetable poisons known, and as one of the most virulent is the monk's-hood, so common in cottage gardens, it is a wonder that not more accidents to children, while thoughtlessly playing with the attractive blue flowers, do not take place. The ancients attributed wonderful curative powers to the root of the peony; such as driving away evil spirits, averting tempests, and protecting corn from injury! And, even now, these whims are not yet entirely banished. Anodyne necklaces, made of beads turned from the dried roots of peony, are still sold to prevent convulsions and assist dentition in children!

This order, therefore, may be rationally called a natural one; because here we see the physical properties and constitutional qualities are congenerous throughout.

The orders which follow *Ranunculaceæ* in the system are chiefly exotics, and, though associated by their external members, are found also to be allied by their medical or other properties. I may notice the order *Berberidaceæ*, because it receives its title from a well-known British hedge-plant. The prevailing property of the order is acidity, which is predominant in the fruit, whether used in the dessert or as a pickle, and the bark and leaves are so astringent as to be useful in tanning leather. But there is another circumstance relative to the barberry, which, in justice to this innocuous plant, requires a remark. The barberry has long lain under the scandal of causing the blight in wheat growing near it. This evil report has arisen from a species of minute fungus *Erysipha Berberidia*, which attacks the foliage of the barberry, resembling the *Rubigo* or rust which destroys or blights the wheat plant; hence it has been supposed that the latter parasite was conveyed from the hedge to the crop in the field. But this supposition is now clearly proved to be groundless, the two parasites being totally unlike each other in nature; nor could both grow on the same plant: that affecting the barberry growing nowhere else, and the rust on wheat being only seen on different species of the order *Gramineæ*.

The next order deserving notice (as substantiating the assertion that the natural system of botany has other claims upon our attention than merely an enrolment of names) is the order *Papaceraceæ* or the poppy tribe. The conspicuous colour of the flowers, their noisome character as a weed among corn, and the intoxicating and sedative medical powers of their juices,

render the family extremely interesting. There are twelve genera in the order, and above three-score species. The common field poppy of this country is sometimes produced in such great quantity among wheat as greatly to diminish the crop; more especially if the wheat seed be laid in on a light and dry tilth; for, if laid in heavy, poppies rarely occur in any considerable quantity.

The poppies are mostly ornamental plants, but their chief importance results from the narcotic powers of their milky juices. They are all more or less soporific, but the inspissated secretions of *Papaver somniferum*, and its varieties, are believed to afford our chief supplies of opium. English opium procured from the *P. somniferum* has been reported to be equal in all respects to that imported from India and Turkey, indeed to yield a larger quantity of morphia than that of foreign growth. The opium trade is one of considerable importance. It is said that the usual consumption of the drug in the United Kingdoms varies from 20 to 25,000 ℔. Its value in bond is 17s. or 18s. per ℔. and the duty is 4s. Here it is chiefly used as a medicine, "but in Turkey and China," says Barnett, "it has escaped from the physicians' control, and is used largely as a luxurious stimulant, and as a substitute for spirituous liquors to produce intoxication. The importation of opium into China is expressly forbidden by law, entirely on moral grounds; but as this drug is as necessary to a Chinese mandarin as claret or Burgundy is to an English gentleman, the contraband trade is very extensive, amounting to 14,000,000 Spanish dollars yearly, and from it alone our Indian government derives, or did derive, an annual revenue of £1,800,000 sterling."

"Some extraordinary cases are on record," continues the same author, "of the effects produced by the continued use of opium, the ecstasies it occasions, and the deplorable condition to which in a short time it reduces the infatuated men who eat it. Notwithstanding, the use of this fascinating drug is on the increase in England, and, in some cases, the drug has become, instead of a medicine, an absolute necessary of life; the persons being utterly miserable, and apparently half dead, until they have swallowed as much as would have poisoned half a dozen healthy men!" Poppies of the large oriental species are cultivated in some places in the west of England as a field crop, not, however, for the manufacture of either opium or laudanum, but merely for the large capsules or seed-vessels which are purchased by druggists for medical purposes. The plants are raised in drills, and stand in very open order, and require rich loamy soil.

The next truly natural order is entitled *Crucifera*, that is, the cross-bearer; because all the flowers have four petals arranged

crosswise. This order is better known (because it is the n generally useful as a pot-herb) than any other, whether grov in the garden or in the field. Every genus of this order is s tory, and partaken of either as solid food or as condime At the head of the culinary species stands the bland and wl some cabbage, with all its varieties of savoys, coleworts, c flowers, brocoli, &c. Of these the leaves and flowers are ea while the thick stems of others of the order are equally us namely, the radish, turnip in all its varieties, kolh rabi, &c. I the seeds of several of this species are eminently useful for ec mical purposes; those of the mustard as a condiment, an which it is extensively cultivated and manufactured, and t of the rape for the useful oil expressed from them, and the or cake which remains is a powerful manure. The whole esteemed as antiscorbutics; for, though some of them are a they are not disagreeably so—the seedling plants of radish, mustard, cress form an excellent salad; indeed many other the horse-radish, sea-kale, land and water cresses, are all diet Many of our gayest garden flowers also belong to this o namely, the wallflower, stock, rocket, candytuft, &c.

Some of the species of the *Brassica* or cabbage family a the greatest importance to the live-stock farmer. To hin turnip is invaluable, it has become the very foundation of Bı farming, for on the successful cultivation of this crop sever the succeeding depend. The broad-leaved rape or colese also a most useful production for sheep-fodder. The con cabbage, both red and white, are grown in fields, for feeding poses, and are always remunerating on good land.

The next order of plants which may be noticed, as pr that the genera and species composing the assemblage a much united by their specific qualities as by their resembl is the *Malvaceæ*, so called from the well-known mallow. are associated, along with the mallow, the altheas, lavat hibiscus, &c. Several species of these genera are nativ Britain, but are here only used in medicine; yet in tro countries, where the malvaceæ abound, they enter exten into the diet of the inhabitants—all of them being san demulcents, whether used as food or medicine. The plants v yield the cotton belong to this order.

Our British species are the musk, the woad, and the r 'eaved mallows, often met with on road-sides and hedge-b The seeds called "chapman's cheeses" are eaten with i ity by children. We have also two sorts of marsh-m nd the tree-mallow, all of which are valued as emo medicines.

The camelias and the tea form together one order; the

remarkable for the beauty of their flowers, and the second for its exhilarating decoction, now an absolute necessary of life. They are distinguished as much by their useful qualities as by their individual habits.

The *Auraniiaceæ*, or orange family, abound in an oderiferous oil, by which the whole tribe, orange, lemon, lime, citron, &c., are eminently distinguished, in the wood and foliage, as well as in their fragrant flowers and excellent fruit. The long-keeping properties of the latter make them as plentiful in this country as if they were natives.

The order *Acerinaceæ*, or maples, are as well known by their saccharine juices as by their outward port. The sycamore or Scotch plane, is one of the largest of the maples. The *Acer saccharinum* is a North American tree, from the stem of which the sap is withdrawn by tapping, and, when evaporated, yields a considerable residuum of excellent sugar; indeed, it has been called the rival of the sugar-cane.

The next natural order of plants which falls under our review, though not, indeed, for the homogeneity of its qualities—for, in this respect, there are extreme differences—but for the great number of species which supply food for man as well as cattle. This is the extensive order *Leguminosæ*, that is, all plants which bear their fruit or seeds in pods, proceeding from butterfly-shaped flowers. The order comprises several lofty fruit and forest trees, as the tamarind and the acacia; many fine shrubs, as the laburnum, the broom, &c.; but the more useful are herbaceous. Here we find the different sorts of clover, sainfoin, tares, vetches, lucerne, pease, beans, &c.; all of which are of the highest importance to farmers, as furnishing various descriptions of provender for feeding and fattening domestic cattle, either as green or dried herbage, or dry corn. A bitter principle prevails in the order, and in some genera is so excessive as to be poisonous to the human constitution. The seeds of the laburnum are dangerous, if accidentally or incautiously eaten; and there are several others which are extremely and dangerously purgative, and yet this bitter quality renders many of the species peculiarly grateful to sheep and other animals. The furze and broom on our commons are considered the chief ornaments of our country by botanical foreigners; and the double flowering varieties of them are kept in hothouses in the north of Europe.

Having noticed several of Jussieu's orders, to shew that the genera included in them are connected by other particulars than mere external form, I shall pass on to one more important order, which, of all others, is the most interesting to man, both directly and indirectly—I allude to that entitled *Gramineæ*, or grasses. This order comprises 158 genera, and above 1,070 species, and

includes trees, shrubs, and herbs. The bamboo and its allies are the only tree-grasses; and though no part except its youngest suckers enter into human diet, yet, as a tropical production, it is one of the most useful to the natives. The cylindrical form of its hollow stems, their strength, durability, finely polished bark, and elasticity, renders the various-sized trunks the most convenient scantling imaginable, either for the house-builder or the mechanic. Beautiful and useful pieces of household furniture, as well as various utensils, are made of those immense straws. But the most important of the grasses are those which have been so long celebrated for producing large seeds and very nutritious leaves, which, for ages, have formed the staple food of domestic animals and man. These have been called the cereal or corn, and the pasture or fodder grasses; and out of between one and two thousand species, there is not above one (the darnel) that is unwholesome.

The cereals are very extensively distributed. In tropical climates there is the sugar-cane, rice, and maize; and in temperate latitudes the principal are wheat, barley, rye, millet, and oats, together with all the pasture grasses. In warm climates the invaluable rice is an aquatic; and it is remarkable that there is an aquatic grass indigenous to Canada, of which it is predicted that, as it may be naturalized in any cold country, it will change "our marshes into corn fields."

Wheat, our principal bread corn, is peculiarly sensible to the effects of soil and climate; for, in different countries, and even in different parts of our own island, the crops and their produce are very various. Sicilian wheat contains more nutritious matter than any grown in Britain; and Middlesex wheat, according to Davy, is more nutritious than that grown in counties farther north. This, by the bye, is an old idea, for the imperious Queen Elizabeth had her finest bread made of wheat grown in the neighbourhood of Stanwell, a parish lying betwixt London and Windsor.

It is worth notice that one of the most troublesome grasses to the farmer is one of the most nutritious. The underground stems of the common couch-grass, when washed and dried, are eagerly eaten by all cattle, particularly sheep and horses, and, to the latter, prove the most wholesome and invigorating food that can be given.

All the true grasses are very similar in appearance, and not less so in their essential or specific properties. The saccharine matter with which they are all more or less charged, is, no doubt, the cause of their being so nutritious and fattening to cattle. And what has been said, relative to the quality of wheat being better or worse according as the soil and situation are more or

less suitable, is equally applicable to the pasture grasses; for we invariably find that the same kinds growing on a hill-side are both more palatable and nutritious than if they grew in a rich valley. It is also observable that every pasture is more effectual in fattening cattle in a dry season than in a wet one; for though, in both cases, the quantity may be less the quality is superior.

The choice of the best species of grass for forming permanent pastures is a material point in farm management; but this particular shall be the special subject of a future communication.

Sugar, and its Effects on Man and Animals. By James H. Fennell, author of "A Natural History of Quadrupeds," &c. —Sugar is one of the most ancient productions of India. Its European names, sugar, sucre, &c., are evidently derived from the Sanscrit *sukkhar*, and sugar-candy from *sukkhar-kund*. The cane is most extensively cultivated in the West Indies; and it was not until lately that it was introduced into the East Indies, but it has spread rapidly there, and the climate all over India seems perfectly adapted to it. The canes of the West Indies may be said to be almost wild and primative, but those of the East Indies are really cultivated, and the great superiority of their sugar affords an excellent proof of the importance of culture. When the cane had been introduced into Bourbon and Otaheite, the same superiority of the quality and quantity of the crops in comparison with those of the West Indies, on similar extents of ground, or from a like number of canes, was remarkable. Attention being called to this fact, the West India proprietors actually obtained the cultivated canes of Bourbon and Otaheite, and planted them to very great advantage about the close of the last century. In Afghanistan the cane thrives well, and yields an excellent sugar, but the people are ignorant of the mode of crystalizing it, and therefore they are indebted to Hindostan for their large supplies of sugar-candy. The Afghans cut the fresh cane into small pieces, which they eat as sweetmeats. The cultivation of the cane has lately been introduced into the island of Singapore, and promises to become one of its most important branches of commerce. Some French capitalists have purchased land at Algiers, on which they are growing it. In Sicily, Spain, and Italy, it was formerly cultivated, but, we believe, its culture is now abandoned in those countries.

Saccharine juice abounds in all the maples; and, in North America, where there are large forests of these trees, a very good sort of sugar is extensively made from two species, though the black sugar maple is by far the least productive of the two. Pursh tells us that the Americans "obtain the juice by tapping the trees in spring; warm days and frosty nights are most favourable to the plentiful discharge of the sap. A hole is made

in the tree, in an ascending direction, with an auger, and a s] made of elder is introduced about half-an-inch, which proj from three to twelve inches. The sap will sometimes flow weeks, according to the temperature of the weather. Troı are placed under the spouts, to receive the sap, which is caı every day to a large receiver, from which it is conveyed, ɩ being strained, to the boiler. Lime, eggs, or new milk is a to the sap, in order to clarify it; but clear sugar may be ɪ without any of these ingredients. The sugar, after being ɩ ciently boiled, is grained, clayed, and refined, in the same ma as the sugar-cane in the West Indies. The sooner the sa boiled the better. It should never be kept more than tw four hours. The quality of maple sugar is superior to that w is made in the West Indies from the cane, and it deposits sediment when dissolved in water. It has more the appear of sugar-candy. The maple-sugar is, in fact, equal to any (sugar, and is procured with little trouble." In the nort Europe, sugar has been obtained from other species.

The traveller, Spencer, has given us an account of the s which the Circassians procure from the walnut-trees that floı in extraordinary perfection on the Caucasian mountains. Dı spring, just as the sap is rising, they pierce the trunk of the and leave a spigot in it for some time. When the spigot is drawn, a clear sweet liquor exudes, which they allow to coagı and sometimes they refine it. They sometimes use, as a subs for sugar, clarified honey, that has been perfectly bleached i sun.

In France, the manufacture of sugar from chestnuts is goiı very promisingly. Some of the proceeds give fourteen per (which is above the mean proportion extracted from beet-roo

Professor J. F. W. Johnston says that the saccharine ex tion that drops from the *Eucalyptus* of Van Diemen's laı not a sort of manna as it was supposed to be, but a pec kind of sugar, which may be collected in considerable quaı When crystallized from alcohol, it gave the same compositio grape sugar, but differs from it in relation to heat and other perties. The honey-dew, which exudes from limes and (trees, is of a saccharine nature, and Curtis says that, if it (be procured in sufficient quantities, it would serve well for sı The Abbe Boissier de Sauvages has, indeed, described "a sh of honey-dew," which fell from a lime-tree in the King's ga Paris. A correspondent of the *Gardener's Gazette* states he had some bee-hives near a large wood of oak, where there honey-dew visible for thirteen successive mornings in Au and that each of these hives produced considerably more h than those which were further off.

ıas been obtained from the leaves of the ash-tree, and stems of the birch-tree, and of some species of palms. nerican cultivators of maize, or Indian corn, find that ıg the stalks of this plant, while immature, they can n excellent sugar. Mr H. Colman tells us that they ıdy ascertained that more than 1000 lbs. weight of . be obtained from a single acre, and he has no doubt ıle that amount would eventually be procured by proper n and management, the manufacture being yet in its

ell known that sugar is yielded largely by the roots of ıd beet. In Russia, there are upwards of thirty beet-ır factories in full operation. This manufacture is ing in Germany. A few years ago, Messrs Fies and d, of Quedlinburg, Westphalia, discovered a process in twelve hours, ten pounds of pure sugar, perfectly ed, may be extracted from 100 lbs. weight of beet-e secret was immediately purchased by M. Brokhoff, of , for 20,000 francs, on condition that it should not be ınd the Rhine and Westphalia. A beet-root sugar manu-ıs been established in Essex; and, in 1837, some refined ıf English beet-root sugar, of good quality and colour, in the London market at £5 per cwt. Mr Rootsey ıt forty tons of mangel-würzel, raised upon a single acre, ıree tons and a-half of molasses.

extracted from pumpkins is equal in every respect to ı beet-root. Potatoes, wheat, barley, beans, and pease, been made to contribute to the "sweets of life," and ı found to yield the greatest quantity while immature. s of *Lamaria*, containing a considerable quantity of highly esteemed by the Japanese, as an article of diet, as been washed in cold water, and then boiled in milk. he base, and on the upper surface of the ovary, in the the *Rhododendron ponticum*, there is a minute glandular n whence exudes a thick clammy juice, which, on dessi-ystallizes into pure white and transparent sugar-candy, rystals, thus naturally formed in the flowers, are some-nd to be as much as three lines in length, especially in pecimens that have withered without fully expanding als. It is remarkable that sugar is yielded in the quantity by plants previous to their attaining perfection, hey have had their flowers plucked off, or have had their ing powers affected by disease or injury. Even in the eing, suffering under certain morbid states, sugar is be secreted by the system. In the *Medico-Chirurgical ions*, second series, vol. viii., Dr Bence Jones has written discoverable in the blood of persons labouring under the

disease of diabetes, and it is well known to be pretty largely contained in their urine.

In all parts of the globe, mankind evince a fondness for sugar, which, in many cases, proves wholesome to the constitution. Mr Montgomery Martin observes that—

A small quantity of sugar will sustain life, and enable the animal frame to undergo corporeal and (as I can add from personal experience) mental fatigue better than any other substance. Often have I travelled with the Arab over the burning desert, or with the wild Afric through his romantic country, and, when wearied with fatigue and a noontide sun, we have set ourselves down beneath an umbrageous canopy, and I have shared with my companion his travelling provender—a few small balls of sugar mixed with spices, and hardened into a paste with flour. Invariably have I found two or three of these balls and a draught of water the best possible restorative, and even a stimulus to renewed exertion. During crop-time in the West Indies, the negroes, although then hard worked, become fat, healthy, and cheerful. In Cochin-China, the body-guard of the king are allowed a sum of money daily with which they must buy sugar-canes, and eat a certain quantity thereof, in order to preserve their good looks and *embonpoint*; there are about 500 of these household troops, and their handsome appearance does honour to their food and to their royal master. Indeed, in Cochin-China, rice and sugar is the ordinary breakfast of people of all ages and stations; and they not only preserve all their fruits in sugar, but even the greater part of their leguminous vegetables, gourds, cucumbers, radishes, artichokes, the grain of the lotus, and the thick fleshy leaves of the aloes. I have eaten in India, after a six months' voyage, mutton killed in Leadenhall market, preserved in a cask of sugar, and as fresh as the day it was placed in the shambles. In the curing of meat, a portion of sugar is often mixed with the salt and saltpetre. The Kandyans of Ceylon preserve their venison in earthen pots of honey, and after being thus kept for two or three years its flavour would delight Epicurus himself. In tropical climates, the fresh juice of the cane is the most efficient remedy for various diseases, while its healing virtues are felt when applied to ulcers and sores. Sir John Pringle says the plague was never known to visit any country where sugar composes a material part of the diet of the inhabitants. Drs Rush, Cullen, and other eminent physicians, are of opinion that the frequency of malignant fevers of all kinds is lessened by the use of sugar; in disorders of the breast it forms an excellent demulcent, as also in weakness and acrid defluxions in other parts of the body. Dr Franklin found great relief from the sickening pain of the stone by drinking half-a-pint of syrup of coarse brown sugar before bedtime, which he declared gave as much, if not more relief, than a dose of opium. That dreadful malady, once so prevalent on ship-board—scurvy—has been completely and instantaneously stopped, by putting the afflicted on a sugar diet. The diseases arising from worms, to which children are subject, are prevented by the use of sugar, the love of which seems implanted by nature in them. As to the unfounded assertion of its injuring the teeth, let those who believe it visit the sugar plantations and look at the negroes and their children, whose teeth are daily employed in the mastication of sugar, and they will be convinced of the absurdity of the statement.*

Dr Willis imputed a corrosive quality to sugar; but, in disproof of this notion, Dr Slare has related, in the *Philosophical Transactions*, No. 337, that his grandfather had, all his lifetime been in the habit of eating, at his breakfast, a great quantity of sugar spread upon his bread and butter, and that he used also to put sugar into his ale and beer, and even into the sauce he ate with his meat. When eighty years of age, he had all his teeth strong and firm, able to crunch the hardest crust, and free from

* History of the British Colonies, vol. ii.

all pain or soreness in his gums. In his eighty-second year, one of his teeth dropped out, and, soon after, he lost another, which was one of the front teeth: in fact, all his teeth dropped out in two or three years; bût, what is most remarkable, they were replaced by the growth of a perfectly new set. His hair was at that time of a very white colour, but it now became much darker. He enjoyed good health and strength, and died in the ninety-ninth year of his age.

The French people are great eaters of sugar, always carrying some of it about with them, in their pockets and reticules, and generally putting five or six large lumps into each cup of coffee.

M. Chossat reports that sugar, when used as the *exclusive* or *principal* article of diet, produces quite opposite effects in some persons, according to the differences in their systems; for, while it fattens some, it creates bile which induces a diarrhœa and a wasting of the solids in other persons. The celebrated Bolivar had, by fatigue and privations, so injured the tone of his stomach, that he was unable at times to take any other food than sugar, which, in his case, was easy of digestion. His personal friends assure us that, in some of his last campaigns, he lived for weeks together upon sugar alone as a solid, with pure water as a liquid; but, probably, in nine hundred and ninety-nine cases out of a thousand, this diet would soon have brought the person adopting it to his grave; for, on those whose digestion is feeble, a large or exclusive allowance of sugar adds to their grievance, because the excess of nutriment, not being generally absorbed by their weakened system, becomes converted to bile, and causes great debility and wasting of the body. In seventeen experiments made on dogs, M. Chossat observed that, when the sugar diet fattened them, there was a general tendency to constipation meanwhile; and, on the contrary, when it produces an excess of bile in other dogs, their bowels were relaxed. Why English children suffer in their digestion after eating largely of sugar-plums, comfits, &c., is chiefly owing, however, to those delicacies being composed of the refuse of starch-works, mixed with plaster of Paris, pipe-clay, or chalk, and having, indeed as little sugar as will suffice to give them a palatable sweetness, and they are often coloured with gamboge, and sometimes with red-lead, verdegris, and other mineral poisons.

Everywhere, the beasts of the field, the birds of the air, the reptiles, fish, and insects, are found to have a great liking for sugar and honey. Mr Martin says he has tamed the most savage and vicious horses with sugar, and has seen the most ferocious animals domesticated by being partly fed upon it. The tamers of lions and tigers owe their power over them chiefly to a judicious use of sugar and other sorts of sweets, and also of lavender-

water, and various other perfumes, of which feline animals are remarkably fond. In the sugar season, in the West Indies, the horses, mules, and cattle soon acquire plumpness and strength by partaking of the leavings of the sugar-canes, after the manufacturer has done with them. In Cochin-China, the elephants, buffaloes, and horses are all fattened with sugar. We learn, from the "Memoirs of Dr Edward Cartwright," (1843,) that that ingenious man used to fatten sheep on sugar. To birds this diet proves so nourishing, that the suppliers of the European poultry-markets find that sugar, along with hemp-seed and boiled wheat, will greatly fatten ruffs and reeves in the space of a fortnight.

Comparative Trial of Manures with Turnips. By Mr John Hogarth, Akeld, near Wooler.—The first trial was made on a light gravelly soil, incumbent on sand mixed with gravel. The turnips were the imperial yellow, and as they suffered much from mildew, were an inferior crop. Indeed, as far as my experience goes, this kind suffers most of any from this disease.

Manures.	Quantity per acre. Tons.	Cwt.	Cost per acre. L.	s.	d.		Produce per acre. Tons.	Cwt.	Stones.
Guano, . . .	0	4	2	5	0	...	14	1	6
Pigs' manure,	12 at 3s. 6d.		2	2	0	...	14	0	6
Compost, . .	16 at 1s. 11½d.		1	11	3	...	14	3	4

Being resolved to have the soil as similar as possible, I had the manures placed in twelve adjacent drills, taking forty square yards to each lot of ground.

The *guano* was mixed with equal parts of fine river sand. The *pig manure* with equal parts of ashes obtained from the servants' depôts. The *compost* was of a more complicated nature; but as its constituents are attainable in every situation, I shall give the method and expense of mixing them:—

	£	s.	d.
Cost of carting 14 cubic yards of mould, road-scrapings, ditch-scourings, or any earth free of stones,	£0	5	6
... of 1½ stone salt, (rock or marine,) per cubic yard of earth, 14 yards, at 5½d. per yard, .	0	6	5
... of 7 cubic yards cow, horse, or fold dung, at 2s. 6d. per yard, ...	0	17	6
... of turning 21 cubic yards of earth and dung, and mixing them intimately, which 21 yards weighed about 16 tons, ...	0	1	10
	£1	11	3

In future, I purpose using the dung in equal parts with the earth, thereby saving the expense of laying it on the drills, and of using about twelve or thirteen tons; and I purpose also of increasing the quantity of salt to two stones per cubic yard.

rial was also made with Swedish turnips upon a gravelly incumbent on a strong subsoil mixed with stones.

Manures.	Quantity per acre.	Cost per acre.			Produce per acre.		
		L.	s.	d.	tons.	cwt.	stones
. . . . .	2 cwt.	2	12	5	24	6	1½
salted, . .	9 tons.						
dust, . . .	1 quarter.	2	19	11	23	2	6½
aric acid, .	40 lb.						
salted, . .	9 tons.						

guano cost 11s. 3d. per cwt.; dung, 3s. per ton, exclusive t; bone-dust, 20s. per quarter; sulphuric acid 3d. per . The quantity of salt, one stone per cubic yard; carting 2s. 11d.

MISCELLANEOUS NOTICES.

mets.—1*st*, It is most probable that a Comet is altogether gaseous, without d matter whatever. Stars have been repeatedly seen through the thickest Sir J. Herschel, for instance, in 1832, saw a group of stars of the sixteenth ude, almost through the centre of Biela's comet. We shall on this subject ourselves with citing some authorities.

rago.—"I think we should conclude—1, That there are comets without 2, Comets of which the nucleus is *perhaps* transparent; 3, Comets more than the planets of which the nucleus is *probably* solid and opaque."

. Herschel.—"Whenever powerful telescopes have been turned on these they have not failed to dispel the illusion which attributes solidity to that ondensed part of the head, which appears to the naked eye as a nucleus; it is true that in some a very minute stellar point *has* been seen, indicating stence of a solid body."

Airey.—"On the physical constitution of comets we have learned nothing, except they appear to be wholly gaseous."

cannot help being convinced that every probability leans towards the truth of eous hypothesis. If this be true, we might as well attempt to ascertain how cloud which is driven against a mountain will tend to break off the top, as te upon any mechanical danger to the earth from contact with a comet. The f such a circumstance would be the mixture of its gaseous material with the here, a permanent rise, probably, in the mean height of the barometer, there is no evidence to make it highly probable that all the comets put to- would have mass enough to produce a sensible effect of this kind;) and, if eous matter should condense sufficiently to descend to the lower regions of nosphere, the effect upon animal and vegetable existence would as likely be bad. For anything rendering the contrary highly probable, the earth may een many times in the tail of a comet.

comets receive their light from the sun is made evident by their alterations iancy. If they shone by their own light, the size would vary with the dis- but not the intrinsic brilliancy. But nothing like phases have been ob- except in a very few instances, which are satisfactorily shewn to be either ul as to the fact, or not such phases as should have been, the position of the l earth being considered. This absence of phases is in favour of the sup- n of an irregular gaseous mass.

e take all the recorded accounts, we should certainly be inclined to imagine e whole system of comets is diminishing in brilliancy and magnitude. But ccounts were written under the bias of terror, and must be considered as

most probably exaggerated. It is impossible to see how the waste which arises from the tail can go on without such diminution. The only positive fact, however, is this, that the comet of Halley, which in 1682 was as round and clear as Jupiter, was not visible to the naked eye in 1759, and in 1836 exhibited a medium brightness, being then in a much more favourable position. The question as to waste is therefore mixed up with others from which it cannot at present be separated.

The nuclei of comets, so far as observed, have varied from 30 to 3,000 miles; the length of their tails from nothing up to more than a hundred million of miles.—*Penny Cyclopædia.*

2dly, The parabolic elements and orbit of the comet are now perfectly well known; the calculations have been made with the utmost precision. It is to the Observatory of Paris that the priority and honour of these bright results belong. M. Arago has received letters from almost all the Observatories of Europe; they prove that none have had the start of ours, and that the observations, where any have been made, are far from being quite irreproachable. Six complete observations have been made at the Luxemburg Observatory, under the direction of its illustrious chiefs, by MM. Laugier, Mauvais, Eugene, Bouvard, &c. The calculations have been executed by the two first-named young and able astronomers, on the one hand, and by M. Bouvard and one of his colleagues on the other. We subjoin the results of the former, which are those carried to the highest degree of perfection:—Period at which the comet was nearest the sun, or passage at the perihelion, (which takes place when the comet has reached the summit of the parabola,) 27th February, at the 4-10ths of the astronomical day, which is reckoned from noon. Distance of the comet from the sun, as its greatest proximity or perihelion distance, with reference to the mean radius of the terrestrial orbit, taken as unit, or, which is the same thing, to the mean distance of the earth to the sun, 0,00548, or about the 5-1000dths, rather more than the radius of the sun, which, therefore, cannot have been touched by the comet's passage. Longitude perihelion—278 h. 45 min. 58 sec. Inclination of the orbit of the comet, or measure of the angle which the plane of its orbit forms with that of the ecliptic, or of the terrestrial orbit—35 deg. 31 min. 30 sec. Longitude of the ascending node—2 deg. 10 min. By the ascending node is meant the point of intersection of the ecliptic, and of the orbit of the comet when it goes from the south of the ecliptic. Movement, retrograde, or in a direction contrary to the movement of the planets, that is to say, from east to west. The astronomical pupils of the Observatory have drawn up a detailed table of the very remarkable circumstances of the movement of the comet in the vicinity of the perihelion. It is seen by this table, firstly, that from the 27th to the 28th of February, the comet, supposed to be seen from the centre of the sun, went over the enormous distance of 292 deg. in 24 hours; secondly, that from 24 minutes after nine to 35 minutes after eleven, it passed from its ascending node to its descending node, (the two opposite points of intersection of ecliptic and of the cometary orbit,) thus going 180 deg. in the interval of two hours; thirdly, that, in 23 hours, its latitude heliocentric or relative to the sun's centre, varied also very considerably. The difference was above 90 deg. It is seen, likewise, that the vector radii, or distances of the comet, also changed much in the same interval of time. M. Arago concludes the narrative of this *pas accéléré* peregrination of our comet by stating a fact more curious than all the preceding ones; it is that, from a comparison of the helio-geocentric latitudes, the comet must have found itself twice in conjunction with the sun; that is to say, produced two successive inverse eclipses, the first at the moment of the passage by the ascending node, at 24 minutes past nine in the evening, the moment at which the comet was, with regard to us, behind the sun's disc; the second at about 15 minutes past twelve at night. The comet was then between the earth and the sun. But, considering the hour, it may be conceived that it could only be seen in the other hemisphere. M. Arago adds that the surface of our globe was rather near being swept by the tail of the comet. This extraordinary phenomenon would inevitably have taken place if the tail had been longer and thinner, or if it had moved in the plane of the ecliptic. The learned secretary regrets much, as a scientific man, that it had been otherwise.—*Paris Paper.*

3dly, The comet is now receding both from the sun and from the earth with great rapidity; it has become very faint; and from these causes, as well as from its being so low, near the western horizon before the twilight is gone, there is scarcely any

nce of its being seen longer in Scotland. It has been one of the most remarkable ets that astronomers have observed. It has been very near the sun, almost ing its surface; indeed, some of the calculations that have been made indicate t the comet has been in actual collision with that luminary. But this result has n obtained from observations made in Europe in unfavourable circumstances, on mall portion of the comet's orbit; and when a more extended series of observa- s is brought to bear upon the investigation, it will probably be found that the net has been at a small distance from the sun's surface. In the meantime, it ms certain that it has made as near an approach to the sun (if not nearer) as the ebrated comet of 1680, the least distance of which from the sun's surface was about ixth part of the sun's diameter. The nearest approximation to the sun took place the 27th of February, and its velocity at that time must have been enormous— arly 400 miles in a second of time. Like the comet of 1680, it, when passing the 1, became very bright, and sent forth a long and brilliant tail, which was imme- itely noticed in tropical countries. There it formed a splendid spectacle. From elligence received from the island of Barbadoes, it appears that the tail was first ceived after sunset on the 28th February; and that, as the comet receded from sun, the body or nucleus became visible on the 4th of March. On that and fol- ring days the comet was so bright that it was seen by the naked eye half an hour fore sunset. In other respects, however, the circumstances of this comet differ m those of the comet of 1680; and there is yet no evidence that it has formerly peared.—*Scotsman.*

AGRICULTURAL REPORT.

December, 1843.

With the exception of a few days of severe frost early in Octo- er, which many people considered portentous of an early and vere winter, the weather has been remarkably mild and even greeable during the whole quarter. No more rain has fallen than render the ground moist enough for the autumnal sowing and to pply the mills with water, and no greater storm has occurred ian squalls of wind. The barometer has been in a remarkable ate for the last fortnight, oscillating only a quarter of an inch bove and below 30 inches, while the wind has continued steadily the west, and the temperature bland; and, even during the esterly gale in the end of November, the effects of which may ave been, it is feared, felt by the shipping on our western shores, has continued to stand that height. This unusual elevation of e mercury at this season of mid-winter seems to indicate that e atmosphere is in a remarkable state of quiescence and purity, id hence of density, in its upper part.

After the occurrence of rain in October, the ground became in fit state for sowing autumn wheat, and, from what we can learn, e subsequent open weather has induced the farmer to sow a rge breadth of wheat. The early frost of October greatly iecked the vigorous growth of the turnip plant, which, but for iat check, would, most probably, have acquired a large bulb,

through the powerful assistance of expanded and vigorous leaves; as it is, the bulb is rather small—a condition not detrimental to the feeding property of the white turnip, but certainly injurious to that of the Swede. It is probable, therefore, that stock will feed faster in the early than the later period of the season, and that the great breadth of turnips sown will render the whole supply not less than usual. Should this mild weather continue, the stem of the turnip may soon be expected to shoot up into the flower-stalk—a tendency which the plant has exhibited all summer. Deficiency in the potato crop has all along been anticipated, but to what extent it may be estimated we have not been able to learn. We believe the deficiency to be very variable over the country, but this we are glad to be assured of, that the early frost in October, which occurred before the potato crop was secured, did none of the injury it was feared it would inflict—that the crop is good in quality and moderate in price.

The market for stock this autumn has been well supplied, and if high prices have not been realized, the satisfaction arising from briskness of demand has been experienced—a satisfaction which has not been felt for the last two years. A dull market is so dispiriting to a man, that he would much rather sell his stock in the early part of the day, at a low price, than take it after standing all day in the market. The demand came from England, the proper quarter, where it is said the turnip crop is good, and abundance of fodder in this country may have had some effect in supporting the demand.

Now that we have had a handling of the grain crops, we can give a more accurate estimate of their yield than at an earlier period. Much of the crop was cut down and stacked without a shower, and the usual practice, in such a state of the weather is, to hurry in the corn into the stack-yard before it is actually won ; and if the corn so treated is thrashed before March, it is sure to come into the market in indifferent condition, which we believe to have been the case this season. The actual experience of the crop we will give in the words of the circular issued on the 21st of November, by an eminent corn-house in Leith, Messrs John Dudgeon & Co. :—" Wheat, we believe, will be found from four to six bushels per acre short of last year's crop, which proved rather above an average, so that we estimate the present crop at not more than a fair average, taking into account that a larger breadth than usual was sown. Such samples as are in good condition, in this neighbourhood, weigh from 62 ℔. to 63 ℔., and select samples 64 ℔. to 65 ℔. per bushel. Barley, of which less than the usual breadth was sown, we consider somewhat under an average, but the quality is generally good,

is said to malt satisfactorily. The best samples weigh 54 lb. to 56 lb., and up to 57 lb. per bushel. Oats, with exceptions, are a productive crop in quality. The quality ticularly good, yielding more meal in proportion to weight the crop of the previous year. The best samples of seed weigh from 41 lb. to 43 lb., and the best potato and Hop-oats 43 lb. to 45 lb. per bushel. Beans and pease are not nsively cultivated, but are said to be good crops." We may that the fine weather occurring at a period of the crop one th later than in England, secured its good quality in this ıtry, though the quantity yielded is not so great as the ap-ent bulk of straw would indicate. The grain market has all ıg been lifeless, and, as a consequence, prices have shewn little fluctuation, not having exceeded 8s. 3d. per qr., from highest to the lowest price during the quarter. "The quan- of foreign wheat imported into Leith during the season ounted to about 140,000 quarters, being nearly one-sixth of whole importation into Great Britain, the total amount being m 5th February till 10th October, 854,375 quarters. There still a heavy stock held here; and the sale of foreign wheat been more limited than was expected, and probably two-rds of what was imported is still on hand. Of English and Scotch eat, the quantity on hand is much less than usual. Our markets ve been, of late, very largely supplied with new grain by the far-rs, who at the time of harvest held very little of the old crop." om all these statements the conclusion seems inevitable that ices cannot fall much, and that, when the passage to the Bal- is again opened after winter, importation to some extent may expected, especially if trade at home continues in its present ely state.

In the account, in the last number, of the Show of the High-nd and Agricultural Society, held in August last, at Dundee, stated, in giving a comparative view of the career of the o short-horn bulls which obtained the first and second pre-iums on that occasion, that Mr Grey's bull, the *Recruit*, had en *beat* at Tyneside. This impression was received by per-ing an account of the proceedings of the Nothumberland Agri-ltural Society at Hexham, held in the beginning of August, at hich *Recruit* was represented, by one of the speakers, as the *rejected* of Tyneside." Such impression, however, was errone-us; for *Recruit* was never shewn in competition for a premium Tyneside, and therefore could not have been *beat*, he being erely offered for sale at Stagshaw Bank Fair, where Mr Grey Dilton purchased him, when a young animal, on account of his ne quality, and the subsequent career shewed that Mr Grey's dgment of him was correct; for we regard the decision against

him at the Show of the Irish Agricultural Improvement Society at Belfast, after the judgment pronounced upon him, by the eminent judges at the Highland and Agricultural Society's Show at Dundee, as not in the least affecting *Recruit's* really high character. His owner, however, Mr Grey of Millfield Hill, did right in protesting against the decision at Belfast on the ground he did, and Mr Hill, the owner of the rival bull *Eden*, we conceive, also did right in declining a second competition, and in claiming the award of the judges. The council of the Society, we conceive, erred in disturbing that award, and suspect they will find it very difficult to resist Mr Hill's just claims to it.

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 10th October, 1842, and 10th of October, 1843—shewing the Increase and Decrease on each head thereof.

	Quarters ending October 10.		Increase.	Decrease.	Years ending October 10.		Increase.	Decrease.
	1842.	1843.			1842.	1843.		
	L.	L.	L.	L.	L.	L.	L.	L.
Customs, ...	5,943,977	5,529,508	.	414,469	19,653,495	18,520,340	. .	1,136,15[illegible]
Excise, ...	3,726,035	3,466,550	240,515	. .	12,124,566	11,786,044	. .	338,5[illegible]
Stamps, ...	1,631,480	1,650,366	18,886	. .	6,547,861	6,464,256	. .	83,6[illegible]
Taxes, ...	177,437	194,100	16,663	. .	4,297,459	4,207,792	. .	89,6[illegible]
Post-Office, . .	168,000	160,000	. .	8,000	591,000	590,000	. .	1,0[illegible]
Miscellaneous, .	33,424	37,744	4,320	. .	714,906	1,871,861	1,156,955	. .
Property Tax, .	313,844	2,047,904	1,734,060	. .	313,844	5,052,057	4,738,213	. .
	11,994,197	13,586,172	2,014,444	422,469	44,246,133	48,492,350	5,895,148	1,648,9[illegible]
	Deduct Decrease.		422,469		Deduct Decrease.		1,648,931	
	Increase on the Qr.		1,591,975		Increase on the Year.		4,246,217	

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date. 1843.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
Sept.	Danzig.	34/ to 43/	20/ to 22/6	10/6 to 14/	20/ to 22/6	24/ to 21/6	17/6 to 22/6
Oct.	..	35/ 42/	18/6 20/	10/ 13/6	19/ 23/	20/6 24/	17/ 21/6
Nov.	..	32/ 39/6	16/ 18/6	9/6 11/	18/6 20/	20/ 24/	16/6 20/
Sept.	Hamburg.	33/6 44/	19/ 24/	11/6 13/6	21/6 23/	23/3 26/6	20/ 22/
Oct.	..	36/ 44/6	16/6 26/	11/ 19/	20/6 22/	18/ 24/	18/ 21/
Nov.	..	32/ 40/6	18/6 24/	10/6 12/	20/ 21/6	16/6 22/6	17/6 [illegible]
Sept.	Bremen.	40/ 45/	17/ 26/	12/ 16/	22/ 26/6	23/6 26/	18/6 23/
Oct.	..	42/ 46/	18/ 24/	11/ 14/6	21/6 25/	20/6 25/	18/ 21/6
Nov.	..	35/6 41/6	16/ 21/6	10/6 14/	20/ 21/6	18/6 22/6	17/6 21/6
Sept.	Konigsburg.	36/ 42/	18/ 22/6	12/ 14/6	18/ 22/6	19/ 24/	19/6 [illegible]
Oct.	..	33/ 39/6	16/6 20/	11/ 13/	17/6 21/	17/6 22/6	18/6 [illegible]
Nov.	..	32/6 38/	14/6 18/	10/ 11/6	16/6 20/6	16/6 20/6	17/6 [illegible]

The Freights which were from 4/2 to 5/6 in August have fallen to from 2/9 to 3/9 per imperial quarter.

TABLE OF PRICES, &c.

rices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

Barley.	Oats.	Rye.	Pease.	Beans.
s. d.	s. d.	s. d.	s. d.	s. d.
30 9	20 2	34 4	33 10	33 7
29 2	19 6	34 0	33 6	32 0
32 2	18 9	33 0	34 4	30 2
34 7	18 3	32 4	33 6	30 7
34 4	17 7	31 6	32 10	30 9
32 4	18 1	30 8	32 6	30 1
30 8	18 2	30 10	32 4	30 2
31 4	18 1	30 4	33 2	30 6
32 10	17 11	29 10	33 0	30 11
33 7	18 10	30 2	33 6	30 10
33 11	19 2	30 0	33 2	32 5
33 6	19 8	29 9	33 7	32 10
33 7	19 10	29 6	33 3	31 3

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1843.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 6.	58 3	26 2	21 10	33 6	34 0
13.	58 4	27 7	20 6	32 4	32 8
20.	53 5	26 7	20 3	33 0	31 6
27.	51 5	26 9	19 7	32 2	32 7
Oct. 4.	50 2	27 5	19 5	33 6	33 10
11.	49 10	28 7	19 6	33 0	33 4
18.	52 5	29 3	19 1	33 0	33 5
25.	53 11	29 9	20 2	33 2	33 6
Nov. 1.	53 2	30 5	20 0	32 8	32 11
8	52 3	31 6	19 9	32 9	33 1
15	51 5	31 2	20 5	31 9	32 2
22.	50 11	31 5	19 9	32 2	32 8
29.	50 5	30 11	19 4	32 0	32 4

LIVERPOOL.

	Barley.	Oats.	Rye.	Pease.	Beans.
	s. d.	s. d.	s. d.	s. d.	s. d.
[illegible]	27 2	18 8	31 4	32 6	33 0
[illegible]	27 6	20 0	31 1	33 6	31 4
[illegible]	26 1	18 10	30 9	33 8	31 0
[illegible]	26 0	17 8	29 10	32 9	28 2
5	28 8	16 9	30 6	32 8	31 2
1	30 9	16 7	30 2	32 2	31 3
2	31 0	17 7	30 8	32 7	32 2
6	30 8	17 2	29 10	32 6	31 8
4	29 3	16 2	30 4	32 10	31 3
0	32 3	17 3	30 2	33 8	32 7
8	28 7	17 10	29 9	34 0	30 10
6	29 6	16 8	29 10	34 4	32 3
7	28 3	17 2	30 2	33 8	33 2

DUBLIN.

Date.	Wheat per Barrel 20 St.	Barley per Barrel 16 St.	Bear per Barrel 17 St.	Oats per Barrel 14 St.	Flour, per Barr. 9 St.
1843.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 1.	28 0	13 6	10 4	9 6	19 1
8.	25 0	13 2	10 6	9 1	18 8
15.	24 2	12 0	10 9	9 0	18 7
22.	24 3	12 4	10 8	8 9	18 3
29.	25 0	12 6	11 6	8 6	17 6
Oct. 6.	25 5	12 3	11 2	8 3	17 4
13.	25 7	12 1	10 10	8 0	17 3
20.	26 2	12 8	11 4	8 7	17 0
27.	26 3	12 5	11 6	8 8	17 2
Nov. 3.	26 6	12 6	11 7	8 11	17 3
10.	26 9	13 0	11 8	9 0	17 0
17.	27 2	13 6	11 10	9 2	17 2
24.	27 7	13 10	12 2	9 2	17 4

wing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. 8, and 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties payabl IGN CORN: the Duties payable thereon, from September to November, 1843.

Wheat.		Barley.			Oats.			Rye.			Pease.			Beans.		
Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
59 4	14 0	31 11	32 6	6 0	20 5	21 1	6 0	31 1	35 3	7 6	32 1	33 8	9 6	32 4	31 11	10 6
57 7	15 0	31 10	32 9	6 0	19 7	20 10	6 0	31 3	34 6	8 6	33 8	33 8	9 6	31 9	32 0	10 6
55 11	17 0	31 5	32 6	6 0	18 10	20 5	6 0	30 1	33 4	9 6	33 3	33 6	9 6	31 2	31 11	10 6
53 11	18 0	31 2	32 2	6 0	18 5	19 10	7 0	29 8	31 10	10 6	32 8	33 4	9 6	30 6	31 8	10 6
52 3	18 0	30 4	31 7	7 0	17 10	19 3	7 0	30 5	30 8	10 6	32 9	33 0	9 6	30 8	31 5	10 6
51 2	19 0	30 2	31 2	7 0	17 9	18 10	8 0	30 8	30 6	10 6	32 6	32 10	10 6	30 1	31 1	10 6
50 7	20 0	30 1	30 10	8 0	17 10	18 5	8 0	30 0	30 4	10 6	32 1	32 8	10 6	30 4	30 9	10 6
50 1	20 0	30 6	30 4	8 0	17 6	17 0	8 0	30 1	29 10	10 6	32 0	32 6	10 6	30 8	30 4	10 6
50 2	20 0	30 9	30 6	8 0	17 8	17 9	8 0	30 3	30 2	10 6	32 7	32 10	10 6	31 1	30 6	10 6
50 6	20 0	30 7	30 7	8 0	18 7	17 10	8 0	29 0	30 0	10 6	33 10	32 8	10 6	31 5	30 8	10 6
50 11	20 0	32 5	30 11	8 0	18 9	17 11	8 0	29 3	29 10	11 6	34 0	33 0	9 6	32 2	30 11	10 6
51 1	19 0	32 4	31 3	7 0	18 11	18 2	8 0	30 5	29 9	11 6	34 2	33 3	9 6	32 4	31 4	10 6
51 2	19 0	32 11	31 7	7 0	19 0	18 4	8 0	30 8	29 11	11 6	33 7	33 6	9 6	32 4	31 8	10 6

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Qu Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the upon which duties have been paid for home-consumption, during the same Month; and t tities remaining in Warehouse at the close thereof, from 5th September to 5th November, 18

Month ending	IMPORTED. From Foreign Countries.	From British Possessions.	Total.	CHARGED WITH DUTY. From Foreign Countries.	From British Possessions.	Total.	REMAINING IN WAR From Foreign Countries.	From British Possessions.
Sept. 5, 1843.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu
Wheat, . .	210,495 2	1,076 1	211,571 3	83,309 7	2,121 5	85,521 4	448,087 3	1,322 1
Barley, . .	42,783 7	689 5	43,473 4	9,677 2	167 1	9,844 3	89,024 4	7,619 4
Oats, . . .	10,047 1	1 0	10,048 1	7,410 3	1 0	7,411 3	38,932 5	. .
Rye, ...	1,015 4	. .	1,015 4	192 7	. .	192 7	880 3	. .
Pease, . . .	5,708 1	1,337 3	7,045 4	1,342 5	1063 2	2,405 7	127,398 5	2,310 3
Beans, . .	712 7	. .	712 7	2,914 6	. .	2,914 6	10,577 7	. .
Totals,	270,762 6	3,104 1	273,766 7	104,937 6	3352 0	108,290 6	715,901 3	11,252 0
Oct. 5, 1843.								
Wheat, . .	368,901 4	. .	368,901 4	741,651 1	895 3	742,546 4	68,659 3	426 6
Barley, . .	42,714 2	. .	42,714 2	129,908 1	. .	129,908 1	10,708 6	. .
Oats, . . .	27,906 6	. .	27,906 6	26,785 5	. .	26,785 5	36,[illegible]63 6	. .
Rye, ...	1,620 5	. .	1,620 5	2,115 3	. .	2,115 3	405 0	. .
Pease, . . .	11,524 0	905 1	12,429 1	18,111 6	2,011 5	2[illegible],123 3	20,273 5	1,203 7
Beans, . . .	3,878 0	. .	3,878 0	4,892 5	. .	4,892 5	168,401 1	. .
Totals,	454,545 1	905 1	457,450 2	923,554 5	2,907 0	926,461 5	245,111 5	1,630 5
Nov. 5, 1843.								
Wheat, . .	54,846 5	983 6	55,830 3	2,671 6	983 6	3,655 4	112,248 2	426 6
Barley, . .	9,230 6	. .	9,230 6	9,225 6	. .	9,225 6	11,597 7	. .
Oats, . . .	15,893 5	. .	15,893 5	1,711 1	. .	1,711 1	46,202 1	. .
Rye, ...	23 6	. .	23 6	23 6	. .	23 6	24 3	. .
Pease, . . .	5,238 5	. .	5,238 5	4,307 5	816 0	5,123 5	20,469 3	383 5
Beans, . . .	152 2	. .	152 2	8,156 4	. .	8,156 4	160,357 7	. .
Totals,	85,385 5	983 6	86,369 3	26,096 4	1,799 6	27,896 2	290,899 7	810 3
Sept. 5, 1843.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, . . .	4,411 0 17	21,016 2 18	25,427 3 7	3,180 1 25	37,369 3 15	40,550 1 12	45,099 3 10	5,383 0 21
Oatmeal, .	186 2 20	420 3 16	607 2 8	273 0 0	420 3 16	693 3 16	162 3 6	2 0 0
Totals,	4,597 3 9	21,437 2 6	26,035 1 15	3,453 1 25	37,790 3 3	41,244 1 0	45,262 2 16	5,385 0 21
Oct. 5, 1843.								
Flour, . . .	9,405 3 23	4,280 2 24	13,686 2 19	23,144 2 18	8,949 3 1	32,094 1 19	34,160 0 13	653 1 6
Oatmeal, .	. .	346 2 8	246 2 8	1 1 26	346 2 8	348 0 6	7 3 18	155 1 18
Totals,	9,405 3 23	4,627 1 4	13,933 0 27	23,146 0 16	9,296 1 9	32,442 1 25	34,168 0 3	8[illegible]8 2 24
Nov. 5, 1843.								
Flour, . . .	25,956 0 13	41,890 3 12	67,846 3 25	1,603 1 11	40,783 1 10	42,386 2 21	55,002 3 16	1,760 3 8
Oatmeal, .	0 1 18	60 0 12	60 2 2	0 1 18	213 2 2	213 3 20	7 3 18	2 0 0
Totals,	25,956 2 3	41,950 3 24	67,907 1 27	1,603 3 1	40,996 3 12	42,600 2 13	55,010 3 6	1,762 3 8

PRICES of BUTCHER-MEAT.

Date.	LONDON, Per Stone of 14 lb. Beef.	Mutton.	LIVERPOOL, Per Stone of 14 lb. Beef.	Mutton.	MORPETH, Per Stone of 14 lb. Beef.	Mutton.	EDINBURGH, Per Stone of 14 lb. Beef.	Mutton.	GLAS Per Ston Beef.
1843.									
Sept.	5/3 to 6/9	5/6 to 7/6	5/3 to 7/6	5/3 to 7/	5/6 to 6/6	5/3 to 6/3	5/ to 6/3	5/3 to 6/6	5/6 to 6/6
Oct.	5/ 7/	5/3 7/9	5/6 7/6	5/ 7/3	5/ 6/9	5/3 6/6	5/3 6/6	5/3 6/6	5/3 6/9
Nov.	5/ 6/9	5/7 7/6	5/3 7/3	4/9 7/	5/ 6/6	5/ 6/6	5/ 6/3	5/ 6/3	5/3 6/6

PRICES of English and Scotch WOOL.

ENGLISH, per 14 lb.			SCOTCH, per 14 lb.		
Merino,	14/6 to	18/	Leicester Hogg,	13/6 to	15/6
in grease,	12/	14/	Ewe and Hogg,	11/6	13/6
South Down,	13/6	16/	Cheviot, white,	11/6	14/
Half Bred,	12/	12/6	Laid, washed,	8/	10/6
[illegible]cester Hogg,	11/6	17/6	unwashed,	7/	8/6
[illegible]we and H[illegible],	11/	15/	Moor, white,	6/	7/6
[illegible]ocks	[illegible]6	8/6	Laid, washed,	5/	6/
[illegible]	[illegible]6	6/	unwashed,	4/6	5/6

JOHNSTON'S AGRICULTURAL CHEMISTRY AND GEOLOGY.

When we consider in what agriculture really consists, we would naturally be disposed to affirm that there are few subjects which offer a wider or more interesting field for scientific research, and one to which the application of scientific principles is more likely to be rewarded by beneficial results. Owing to the multiplicity and diversified nature of the objects which agriculture embraces, it touches, at some point or other, on almost all the sciences—enters, as it were, within their respective provinces, and thereby becomes the direct and legitimate object of their investigation. Nearly all the sciences, therefore, may be pressed, with advantage, into the service of husbandry, may be made her handmaidens, and minister to her interests. At the same time, it is not easy to imagine how any subject can present stronger inducements, to those competent for the task, to enter upon investigations of this nature. It is scarcely possible to take even a superficial glance at the general aspect of husbandry, as now practised, or to consider its history, without the conviction that it is susceptible of great improvements, even in many of its simplest and most obvious processes. Its more delicate and recondite operations were, till lately, almost wholly misunderstood, and still present to the scientific investigator a kind of *terra incognita*, on which he can scarcely enter without being rewarded by the discovery of important facts. Every step in his progress may indeed be attended with momentous results: he may elicit truths calculated to modify, in some measure, the whole theory and practice of husbandry; to shorten and facilitate its operations; to augment its productiveness; and thereby confer incalculable benefit on one of the most vital interests of a nation.

But with all this amplitude of scope for scientific research, and attractiveness in the subject itself, how little has science done for agriculture! The farmer has been left to grope his way in comparative darkness, and to discover, as he best might, by long and often dear-bought experience, what might have been instantly revealed to him by a single ray from the light of science. Even that branch of science which is at all times indispensable to the art of cultivating the fields, and must have been, in some degree, coeval with it, namely, mechanics, cannot be said, notwithstanding a few notable exceptions, to have been, upon the whole, very successfully applied to agriculture. How rude and unskilfully constructed were many of our agricultural implements a few years back! And may not the exhibition, at every agricultural show, of such a multitude of plans for modifying or superseding the implements now in common use, be

regarded as a proof of the existence of a pretty general conviction that these are very far from being perfect? Professing to hold in their hands the golden key which gives access to many of the hidden operations of nature, an acquaintance with which is so essential to the prosperity of agriculture, our philosophers and men of science have long stood by with indifference, or, at least, with neglect, and turned to little account the treasure with which they were intrusted. Perhaps both they and the practical husbandman were equally to blame for this. The former should, of their own accord, have given a practical direction to a description of knowledge so well calculated to benefit the community; the latter should have made known his wants, described his diseases, and urgently applied for the remedy. But the very mention of blame suggests also the explanation and the excuse for both the one party and the other. The truth is, that it could scarcely have been otherwise from the nature of things. Most of the sciences which are best fitted to benefit agriculture are comparatively of recent growth, or, at least, have only of late been studied in such a way as to give them a direct practical bearing. Their votaries had to employ all their energies in fixing the great principles of their respective sciences—in laying a broad and solid foundation—before they could condescend to details, or follow out these principles in their various ramifications. Take geology as an example. All had to be settled between the Plutonists and the Volcanists, between the Huttonians and their adversaries; the various strata had to be examined and classified; extensive surveys had to be made of the different formations; minerals and rocks had to be compared and analyzed; and many other preliminary investigations had to be undertaken, before the geologist was in a condition to give sound and useful information to the farmer respecting the origin and mineral composition of the soil of his fields. So it was, more or less, with the other sciences: they had themselves to be firmly fixed and established before they could offer aid to others. The practical husbandman, on the other hand, could not be expected to know, in many cases, the precise nature and cause of his unsuccessful exertions, and was, consequently, ignorant where he should apply for assistance. He felt himself in a state of general unhealthiness, but was unable to lay his hand on the seat of any particular disease; the direct application of a special remedy was, therefore, impossible; and thus was he kept apart from the man of science, who might have been in a condition at once to point out the nature of the evil, and to suggest the means of cure.

But not only has agriculture failed to obtain that benefit from science which it might have afforded, she has also suffered from the tardy and inadequate dissemination of the knowledge relating

rural affairs which actually exists. How meagre and vapid as the greater part of our earlier agricultural literature! and, to a very recent period, it was still very defective, and greatly arrear of the actual practice. This was probably owing, in a reat measure, to the great reluctance practical farmers have nerally shewn to commit anything to writing. It was foreign their habits to do so; and they seemed to have a latent prehension of the formality and responsibility of authorship. ence the accumulated experience of many an aged and intelli- nt cultivator of the soil has been withheld from the general ock of knowledge, and he has failed to benefit his fellows to the tent of his ability. Even when, a considerable number of ears ago, such vigorous exertions began to be made for the diffu- on of useful knowledge, and treatises of every possible form and mplexion, on almost every possible subject, were circulated in e greatest profusion, comparatively few were devoted to the bject in question. This, perhaps, from the character of many these treatises, is not so much a matter of regret: they were o unsubstantial to form a safe foundation for the superstructure knowledge; yet they might have tended to excite a desire r information, which they of themselves were inadequate to pply. Even milk and water is better than absolute deprivation. These remarks, however, may be considered as pointing to a ate of things which has now passed away. The tide has lately t in with an opposite current, and both science and literature e offering all their aids to agriculture, with a zeal which pro- ises amply to compensate for former neglect. The farmer and e man of science are now coming into contact, and are begin- ng to feel that it is their mutual interest to go hand in hand. he sciences which bear more directly upon agriculture have w attained to such a degree of perfection, that they admit of ing applied to it with the greatest advantage. This is the se more especially with geology and chemistry, particularly the tter, in which the difficult process of analysis can be conducted ith wonderful accuracy. Of all the sciences, it is doubtless from emistry that agriculture has most to expect. The inestimable nefits she has conferred on such of the arts as she has tempted to improve, justify the belief that she will likewise in some signal triumphs in this comparatively new field of search. It is, therefore, most gratifying to perceive that such ertions are now making to try what she can here accomplish, d to bring her resources fully to bear on the objects and opera- ons of husbandry. It cannot be otherwise than that important vantages will be thereby obtained. Is it to be supposed for a oment that a science which has so improved all the practical ts of life to which it is applicable will fail in producing like

results in a department so extensive as this, and presenting so many subjects which fall directly within her province? The idea is not to be entertained. And let no one imagine that, although an enlightened application of chemistry to agriculture may not be speedily attended with any very striking or splendid results, it is failing on that account to fulfil the most important purposes. Such results *may* be obtained; a new path *may* be struck out, which leads easily and directly to points which we can at present gain only by a laborious and tedious circuit; but it is worthy of being repeated, that if such is not the case, at least in the first instance, no reasonable expectation ought to be disappointed. It ought to be kept in mind that, in many cases, the labours of the laboratory will lead to the same conclusions, and suggest the same practice, which have already been arrived at by observation in the field. In both instances, the object is to discover the processes which nature employs to bring her productions to perfection, and, by means of this knowledge, not only to avoid doing anything to obstruct these processes, but to use every means to facilitate and promote them. It will often happen, therefore, that the chemist, with all his appliances, will be unable to raise a better crop than the farmer can do merely by dint of his own experience. But, even in such a case, how great are the advantages which the chemist possesses, and how superior is the position he occupies to that of the other! The one resembles a man working a piece of mechanism, with the construction of which he is wholly unacquainted; the other like one who is familiarly conversant with the whole theory of its movements, can alter and regulate its parts, and, if any of these are injured, reconstruct them anew. Calling in the aid of physiology, chemistry can explain the whole progress of growth and nutrition, the effects of the soil, and of the various ingredients of which it consists—the influences of heat, moisture, and, in short, everything on which the life and prosperity of the plant depends. It makes us acquainted with the *rationale*—the whole process and reason of the thing. It lets us, as it were, into the secret, as far as such secrets are revealed to human eyes. What a vantage-ground this is to occupy! And this full explanation of common agricultural operations which chemistry is competent to give, even when she has nothing to suggest for their improvement, is the best preparation for future discoveries. It gives us a secure and settled basis of operations—a fixed point from which we can safely make a forward movement in any given direction. It places us on an eminence, on which the coming light is first likely to strike. Great discoveries are generally the fruit of intelligence—the reward given to the labour necessary for the acquisition of knowledge. Let us, in the first

stance, pay the price. Even if no discovery analogous in importance to that of the safety-lamp or the artificial formation of lapis lazuli be speedily vouchsafed to our exertions, we are certainly in the right way ultimately to obtain them; and, in the meanwhile, let it not be doubted, we are securing important advantages to agriculture. We are bringing it out of a region of comparative darkness, uncertainty, and partial empiricism, and placing it within the confines of assured and positive knowledge. We are rendering it a more befitting subject to exercise enlightened and intelligent minds, and raising it, in the best sense of that term, to all the dignity of a science.

It is true that chemistry is not now for the first time applied to husbandry. It may be said to have first been so, in a scientific manner, in the early part of the present century. Lord Dundonald and Sir H. Davy led the way; and it cannot fail to be matter of surprise that the invaluable aids so distinctly pointed out by the latter, as capable of being given by chemistry to agriculture, should not have led to greater efforts to secure them. The truth is, that the period between the appearance of Sir H. Davy's work and a date very little prior to the present time has been almost a continuous blank in regard to the matter of which we now speak. Some of the causes of this have already been alluded to; but whatever may be the explanation, the fact is not the less to be lamented. Now, however, owing to the advancement of his science, every chemist of any pretension is in a condition to accomplish more in this department than Sir H. Davy, even with his transcendent powers. He starts not merely from the advanced point where the latter left it, but greatly a-head of it, and with the advantage of facilities which are every day increasing. We count it no small matter that we can claim one of those individuals who have taken the lead in this new career. Liebig in Germany, Boussingault in France, and Johnston in Britain, may be regarded as the triumvirate who have done most to bring about this improved state of things. In a great measure through the exertions of the latter, the public mind in this country has been awakened to the importance of the subject, and agriculturists are everywhere eager for information. By his connection with the Agricultural Chemistry Association of Edinburgh—an association which reflects so much credit on the enterprise and intelligence of our practical Scottish agriculturists—it is to be hoped that he will have an opportunity of holding personal intercourse with a large number of our northern farmers, and imparting to them orally that instruction which his recent lectures in the metropolis shew him to be so eminently qualified to give. We are gratified to perceive that his labours among them have already begun in different parts of the

country, and the degree of interest everywhere manifested fo the best augury of success. Meanwhile, we do not think we can better serve the great purpose which he has in view, which every one interested in husbandry ought to do his utı to promote, than by transfusing into our pages some portioı the valuable information contained in his published lecture the application of chemistry and geology to agriculture.* perusal of this work by those who may hereafter have an op tunity of listening to his oral prelections, will form the best paration for profiting by them; while to such as cannot ol this advantage, it will constitute the best possible substitute.

These lectures are distinguished for clearness and perspic lucidness of arrangement, and a simplicity in the mode of h ling the subject, which brings it readily within the compre sion of those who have little or no previous acquaintance the sciences of which they treat. Originally addressed to a ciety of practical agriculturists, it was necessary to divest t of the formal and often, to appearance, cumbrous nomencl and phraseology of science, and to refer to no philosophical ciples without fully explaining them. For the sake of clear the subject is divided into four parts, the study of each pr ing part preparing the way for a complete understanding of t which follow. Thus, the *first* part is devoted to the *organi ments* and parts of plants, the nature and sources of these ments, and to an explanation of the mode in which they be converted into the substance of plants; the *second*, to the *ganic elements* of plants, comprehending the study of the from which these elements are derived, and the general rela of geology to agriculture; the *third*, to the various met mechanical and chemical, by which the soil may be impr and especially to the *nature of manures*, by which soils are more productive, and the amount of vegetable produce increa and the *fourth*, to the *results of vegetation*, to the kind and of food produced under different circumstances, and its rel

* Lectures on Agricultural Chemistry and Geology, by F. W. Johnston, F.R.SS.L. & E: Blackwood, Edinburgh. The second edition, which has b some time in the course of publication, is just about to be completed. Th edition of Mr Johnston's Elements of Agricultural Chemistry and Geology, improved, has just appeared. It may be mentioned as an interesting fact co with this useful little work, that besides the other reprints which have at times appeared in the United States, one gentlemen in New York has been expense of printing an edition of ten thousand copies, and distributing them g ously among the schools of the State. A translation is also on the eve of publi under the revision of the president of the Royal Academy of Agriculture at holm, for the use of the agricultural schools recently established in Sweden Johnston has been solicited to compose an Elementary Catechism on the sam ect, with a view of being introduced into Scottish schools, which little work, w [illegible] published by the time this reference to it appears.

to the growth and feeding of cattle, and to the amount and quality of dairy produce.*

The first of these subjects affords least scope for originality, and is less essentially of a practical nature than many of the others, and may probably, therefore, be of less interest to agricultural readers. It cannot be too strongly impressed on their minds, however, that without a pretty accurate knowledge of the topics here discussed, they will not be in a condition so thoroughly to understand and appreciate what follows. The different kinds and states of matter—the characteristic properties of organic substances—the constitution of the atmosphere—of water—sources from which the food of plants is derived—the structure and functions of plants—the chemical changes which they undergo in their different states—how their supply of food is kept up, and many other subjects of a like nature, must necessarily be understood as forming the basis on which all practical improvements ultimately depend. They are treated in a very distinct manner, and with a profusion of details which, of course, we cannot here attempt to follow. We may give, however, the conclusions at which our author arrives, from the consideration of the organic constituents of plants. They are the following:—

1°. That all vegetable productions consist of two parts—one the organic part, which is capable of being burned away in the air; the other the inorganic part, which remains behind in the form of ash.

2°. That this organic part consists of carbon, hydrogen, oxygen, and nitrogen only.

3°. That plants derive the *greater part* of their carbon from the carbonic acid of the atmosphere, and their oxygen and hydrogen from water, and of their nitrogen from ammonia and nitric acid.

4°. That by far the largest portion of those substances which form the principal mass of plants, such as starch and woody fibre, consists of carbon united to oxygen and hydrogen, in the proportions in which they exist in water, or, in other words, may be represented by carbon and water in various proportions.

5°. That the food on which they live enters by the roots and leaves of plants—that the leaves, under the influence of the sun, decompose the carbonic acid, give off its oxygen, and retain its carbon—and that this carbon, uniting with the elements of water in the sap, forms the several compounds of which plants chiefly consist.

6°. That the supply of carbonic acid in the atmosphere is kept up partly by the respiration of animals, partly by the natural decay of dead vegetable matter, and partly by combustion; that ammonia is produced and supplied to plants chiefly by the

* Preface, p. 4.

natural decay of animal and vegetable substances; and r acid partly by the natural oxidation of dead organic matter, partly by the direct union of oxygen and nitrogen, througl agency of the atmospheric electricity.

7°. That while both of these compounds yields nitroge plants, they each exhibit a special action on vegetable lil virtue of the hydrogen and oxygen they respectively contain. exercise also a so-called *stimulating* power, by which plants induced or enabled to appropriate to themselves, from (natural sources, a larger portion of all their constituent elen than they could otherwise obtain or assimilate.

As an example of the tone of reflection with which the strictly scientific parts of the subject are occasionally intersp and relieved, we select the following. After stating that organic part of vegetables consists of four elementary bo namely, carbon, oxygen, hydrogen, and nitrogen, he proceed "We have seen that oxygen, hydrogen, and nitrogen, ar gaseous substances, which, when pure, are destitute of co taste, and smell. They cannot be distinguished by the a the senses. Man, in a state of nature—uneducated man— not discern that they are different. Yet so simple an in ment as a lighted taper at once shews them to be totally u each other. This simple instrument, therefore, serves us ins of a new sense, and makes us acquainted with properties existence of which, without such aid, we should not even suspected. Has the Deity then been unkind to man, or sti in his benevolence in withholding the gift of such a sense? the contrary, he has given us an understanding, which, when tivated is better than twenty new senses. The chemist ir laboratory is better armed for the investigation of nature if his organs of sense had been many times multiplied. He many instruments at his command, each of which, like the ta tells him of properties which neither his senses nor any oth his instruments can discover; and the farther his researches carried, the more willingly does nature seem to reveal her sec to him, and the more rapidly do his chemical senses incre Do you think that the rewards of study and patient exj mental research are confined to the laboratory of the chemist, that the Deity will prove less kind to you whose daily toil i the great laboratory of nature? As yet you see but faintly reason of many of your commonest operations, and over results of which you have comparatively little control; but light is ready to spring up, the means are within your reac you have only to employ your minds as diligently as you lal with your hands, and ultimate success is sure."—(P. 32.)

Having shewn how important the study of the organic ...nts . plants is, to enable us to understand the best mod

ıting them, our author, in the second part of his work, ıds to the consideration of the inorganic constituents of , forming another part of the subject not less important. ı vegetable substances are heated to redness in the air, the ic elements, enumerated a little above, are burned away, isappear ; but there remains a residuum, or *fixed* portion, does not burn, and is not diminished when exposed to a ıat. This is commonly called the ash, and it constitutes organic portion of plants. It exists in a very small pro- n compared with the organic or combustible part, which in general, from 88 to 99 per cent. of their whole weight. ılly constitutes, however, an essential part of their sub- ', without which they cannot be healthy, or perfect all their and it becomes, in consequence, as much the duty of the hus- ıan to supply the inorganic elements when they happen to nting in the soil, as it has always been considered his pecu- ıre to place within the reach of the growing plant those ing vegetable matters which are most likely to supply it organic food. "It is difficult to conceive the extent to the admission of the essential nature and constant quality : inorganic matter contained in plants must necessarily y our notions and regulate our practice in every branch iculture. It establishes a clear relation between the kind uality of the crop, and the nature and chemical compo- of the soil in which it grows ; it demonstrates what soils to contain, and, therefore, how they are to be improved ; lains the effect of some manures in permanently fertilizing, f some crops in permanently impoverishing, the soil; it ates the action of mineral substances upon the plant, and how it may be, and really is, in a certain measure, *fed* by the ıarth ; over nearly all the operations of agriculture, indeed, ws a new and unexpected light."—(P. 261.) Plants, therefore, l upon dead, unorganized, mineral matter, and the soil is manured when such substances as gypsum, nitrate of soda, ne, are added to it; they are not to be regarded merely ɜ light of stimulants. The different earthy substances in the ash of plants are generally the following :—Potash, lime, magnesia, silicia, alumina, oxide of iron, oxide of ınese, sulphur, phosphorus, chlorine. The quantity of each, l by different plants, varies greatly: thus, in 1000 lbs of lowing vegetables—

leaves	12 lbs of ash.	Wheat straw,	50 lbs.	Meadow hay,	60 to 100 lbs.
',	20	Barley straw,	50	Clover hay,	90
	35	Oat straw,	60	Rye-grass hay,	95
	10	Rye straw,	30	Potatoes and	
ı corn,	15	Indian corn,	40	turnips,	8 to 10
,	30	Pea straw,	50	Carrots,	10
	28				

It follows, from this, that some kinds of crops extract from the soil a much greater amount of inorganic matter than others; and, by a certain course of cropping, it is possible to exhaust it entirely, when the soil necessarily becomes barren. Whence are these inorganic substances derived? None of them exist in the atmosphere; the soil, therefore, must be the source from which they are exclusively obtained.

The subject of the origin of soils brings us into direct relation with the science of geology, and many of the results to which it leads are of the highest utility and interest. "Werner," says Cuvier, in his biographical sketch of the father of mineralogy, "fancied that stones could speak, and he thought himself warranted confidently to demand of them the whole history of the world. He connected the history of man and animals with that of minerals; even the laws of the military art he traced to those of geology." Without making such extensive demands upon it, the agriculturist readily obtains much valuable information from geology. The relation between the soil and the rocks on which it rests, is, in many cases, direct and obvious; and, in every instance, an acquaintance with the geological character of a country throws the greatest light upon the nature of its soil as well as other agricultural capabilities. We learn from geology the origin of soils and the causes of their diversity; the reason of one kind of manure proving effectual in one instance and failing in another; the proper materials for intermixing with them; and the sources from which these materials are to be obtained. If soils always occupied the position where they were originally formed by the crumbling down of rocks, the latter would always be a direct and infallible indication of their real nature: this is the case in many districts where disturbing causes have not been strongly in operation. But, by the action of water, winds, and other geological agents, they have often been removed from their original site, and transported to a great distance, so as entirely to lose their relation to the subjacent rocks. But even here geology is the best guide; for, by explaining the laws by which these transportations are effected, it enables us more easily to form an opinion as to their real nature. "Thus," says our author, "though the occurrence of extensive fields of drift over various parts of almost every country does throw some further difficulty over the researches of the agricultural geologist, and requires from him the application of greater skill and caution before he pronounces with certainty in regard to the agricultural capabilities of any spot before he visits it, yet it neither contradicts the general deductions of the geologist, nor the special conclusions he would be entitled to draw in regard to the ability of any country, when rightly cultivated, to maintain in comfort a more or less numerous population. The political economist may still, by the survey of the

ogical map of a country, pronounce with some confidence to t degree the agricultural riches of that country might, by istry and skill, be brought; and which districts of an entire tinent are fitted by nature to maintain the most abundant ulation. The intending *emigrant* may still, by the same ns, say in what new land he is most likely to find a propitious on which to expend his labour, or such mineral resources as best aid his agricultural pursuits; while a careful study of geological map of his own country will still enable the skilful adventurous *farmer* to determine in what counties he will t with soils that are suited to that kind of practice with ch he is most familiar, or which are likely best to reward him the application of the newest and most approved methods of ture."—(P. 400.)

n reference to this part of his subject, Mr Johnston makes some gestions as to the expediency of constructing geological maps, h the express view of illustrating the agricultural character of different parts of our own country. These should exhibit not y the limits of the rocky formations, but also the nature and tive extent of the superficial deposits (drifts) on which the soils often rest, and from which they are not unfrequently formed. ese would afford a sure basis on which to rest our opinions in ard to the agricultural capabilities of the several parts of a coun-, in which, though the rocks are the same, the soils may be very erent. To the study of these drifted materials, in connection h the action of ancient glaciers, the attention of geologists is present much directed, and from their labours agriculture will fail to reap her share of practical benefit. "It seems not vorthy of the consideration of our leading agricultural socie-," Mr Johnston adds, "whether some portion of their encou-ement might not be beneficially directed to the preparation igricultural maps, which should represent, by different colours, agricultural capabilities of the several parts of each county, ed upon a knowledge of the soils and subsoils of each parish township, and of the rocks, whether near or remote, from ch they have been severally derived."—(P. 401.) Such an ect would be greatly facilitated by geological surveys similar hose undertaken at the suggestion of the Highland and Agri-ural Society of Scotland, and not a little also by the Trigo-netrical Survey of Scotland now going on—if such an expres-n can be used with propriety in reference to it—under the ection of government, when the distant day of its completion ll have arrived.

Duly impressed with a sense of the importance of geology to iculture, our author enters at considerable length into the ails of the subject, explaining the general principles of the

science, the nature of the various rocks and strata, and, in particular, furnishes us with an elaborate account of the distribution of the various formations in the British islands, the character of the respective soils thence resulting, and consequent agricultural peculiarities of different districts. The general subject of soils he concludes with the following brief summary of their functions, in reference to vegetation:—

1°. The soil upholds and sustains the plant, affording it a sure and safe anchorage.

2°. It absorbs water, air, and heat, to promote its growth.

These are its mechanical and physical functions.

3°. It contains and supplies to the plant both organic and inorganic food, as its wants require; and,

4°. It is a workshop in which, by the aid of air and moisture, chemical changes are continually going on, by which changes their several kinds of food are prepared for admission into the living roots.

These are its chemical functions.

It is to aid the soil in the performance of these functions that all the operations of the husbandman are directed; they consequently resolve themselves into two corresponding classes of operations, namely, *mechanical*, including draining, ploughing, mixing with clay, sand, &c., and *chemical*, including liming, marling, and the application of vegetable, animal, and mineral manures. It is to this department of the subject that the third portion of these lectures is devoted, and it is treated at a length, and with a multiplicity and precision of details, such as the high importance of the subject, from its direct practical bearing, and from its being hitherto most imperfectly understood, rendered necessary.

Among the mechanical means of improving his land, no British farmer is now insensible to the paramount advantages of draining. Without this preliminary step, in every case where there is a superfluity of moisture, it is scarcely worth while to attempt any kind of improvement. Its practical benefits are here stated as follows:—

It is equivalent not only to a change of soil, but also to a change of climate, both in reference to the growth of plants and to the health of the population.

It is equivalent also to a deepening of the soil, both by removing the water and by allowing those noxious ingredients to be washed out of the subsoil which had previously prevented the roots from descending.

It is a necessary preparation to the many other means of improvement which may be applied to the land. Even light and sandy soils, or such as lie on a sloping surface, may be benefited

draining, because the noxious matter, which either sinks down m above, or oozes up from beneath, may long remain in the soil even in such circumstances, and prove more or less injurs to the plants. A sloping surface does not necessarily dry subsoil, free it from noxious substances, or permit the connt access of air. When the springs are impregnated with n the evil is, in all cases, greatly augmented, and from this use alone, if no outlet for the water exists, a greater or less gree of barrenness ensues. It is to this lingering of unwholeme water beneath that many of our moor-lands, especially on gher grounds, is in a great measure to be attributed. A calreous or ferruginous spring diffuses its waters through the subil, the slow access of air from above, or, it may be, the escape air from the water itself, causes a more or less ochrey deposit, ich cements the stones and particles of earth together. A yer as hard as stone is at length formed, constituting what is own by the name of *moor-band pan*, and hopeless barrenness adually ensues. Most advantages, however, are attended with rtain drawbacks: the more efficiently land is drained, especially it be of a light and porous nature, the greater risk there is that e saline and other soluble substances they contain will be washed t by the water which trickles through them. It will often ppen, therefore, that such lands require to be more liberally alt with than before, with certain kinds of manure, to enable em to repair the loss thus sustained.

The extensive and interesting subject of manures, on whch we n scarcely do more than touch in this place, is one in which e advantages agriculture may derive from chemistry appear st conspicuous. Indeed, we cannot here make a single step thout appealing to chemistry; or, at all events, if we neglect do so, it is at the risk of committing serious error. It is in e application of special manures and in the discovery of other bstances than those now in use, as well as in the means of proicing all the artificial substances thus used in greater abundce and more economically than at present, that the utility of ricultural chemistry is likely, in the first instance, to be most rikingly demonstrated. The great improvements in this dertment which she has already pointed out, may be taken as an rnest of what may yet be achieved. Mr Johnston treats of the bject under three heads. 1st, Mineral manures, including ose substances, whether simple or mixed, which are of mineral igin, or which consist entirely of inorganic or mineral matter, such lime. 2d, Vegetable manures. 3d, Animal manures. In order ensure success in the application of saline manures, the folving general conditions are necessary:—

1°. They must contain one or more substances which are necesry to the growth of the plant.

2°. The soil must be more or less deficient in these substan

3°. The weather must prove so moist, or the soil be spongy, as to admit of their being dissolved and conveyed to roots.

4°. They must not be applied in too large a quantity, or all ed to come in contact with the young shoots in too concentra a form; the water that reaches the root or young leaves m never be too strongly impregnated with the salt, or, if the weat be dry, the plant will be blighted or burned up.

5°. The soil must be sufficiently light to permit the salt ea to penetrate to the roots, and yet not so open as to allow it be readily washed away by the rains.

Of all the mineral substances which have ever been made av able in practical agriculture, that which has been most ext sively employed, and which has been productive of the great good, is unquestionably lime, applied in some one or other of various forms, either as shells, shell-sand, marl, chalk, limesto quicklime, &c. It may be said to have completely changed aspect of many of our agricultural districts, and to have brou many others under the plough, which, but for it, would h remained in a great measure profitless wastes. It has been cal "the basis of all good husbandry;" and Mr Johnston accordin dwells upon it at great length, illustrating separately the vari points, both of theory and practice, which present themselves relation to a substance which has been of almost universal ap cation to the soil. It is never met with in nature except i state of chemical combination with some other substance. . its varieties, in an unburned state, consist of carbonate of lin when burned in the kiln, the carbonic acid is driven off, and caustic or quicklime remains. The proportions of the carbo acid and lime consist, in some instances, of about 11¼ cwts. lime in one ton of pure dry carbonate. Limestones almost alw contain other substances, ranging in quantity from five to twe per cent. The quantity of earthy matter in a limestone n easily be ascertained, simply by introducing a known weight it into cold diluted muriatic acid, and observing and weigh the part which, after twelve hours, refuses to dissolve or exhi any efforvescence. It is to the presence of these foreign substan that limestones generally owe their colour, the pure carbon being perfectly white. The natural forms in which carbonate lime is applied to the land, are marl, chalk, shell-sand, coral-sa limestone-sand and gravel, crushed limestone. All of these, the first place, have a *physical* effect in altering the natural text of soils; and, secondly, a *chemical* effect in rendering the soil p ductive of larger crops. "They alter the nature and quality of grasses when applied to pasture—they cover even the undrai ·'th a short rich grass—they extirpate heath, and bent,

seless moss — they exterminate the weeds which infest the nlimed corn-fields—they increase the quantity, and enable the and to grow a better quality of corn—they manifest a continued ction for many years after they have been applied—like the purer imes, they act more energetically if aided by the occasional addiion of other manure, and, like them, they finally exhaust a soil rom which successive crops have been reaped, without the requisite return of animal or vegetable matter."—(P. 545.) Pure lime produces effects similar to those of the marls, &c. 1°. *It alters the natural produce of the land*, by killing some kinds of plants and favouring the growth of others, the seeds of which had been lying dormant. The corn marigold is an example of the former, while white clover, yellow cow-wheat, yellow rattle, (*Rhinanthus crista Galli,*) and coltsfoot may be cited as instances of the latter. Heath, moss, and bent *(agrostis)* likewise disappear by degrees, and are succeeded by a sweet and tender herbage mixed with clover. 2°. *It improves the quality of almost every cultivated crop*: under its influence the grain of corn acquires a thinner skin, is heavier, and yields more flour—potatoes become more mealy and agreeable to the taste—turnips are both increased in quantity and improved in quality—pease better tasted, and are more easily boiled soft, &c. *It hastens the maturity of the crop.* This it does, in most instances, by ten or fourteen days. "The liming of the land is the harbinger of health as well as of abundance. It salubrifies no less than it enriches the well-cultivated district. Where the use of lime and the drain go together, it is difficult to say how much of the increased healthiness of the district is due to the one improvement and how much to the other. The lime arrests the noxious effluvia which tend to rise more or less from every soil at certain seasons of the year, and decomposes them, or causes their elements to assume new forms of chemical combination, in which they no longer exert the same injurious influence on animal life. How beautiful a consequence of agricultural skill, that the health of the community should be promoted by the same methods which most largely increase the produce of the land! Can you doubt that the All-benevolent places this consequence so plainly before you as a stimulus to further and more general improvement, to the application of other knowledge still to the amelioration of the soil?"—(P. 572.) It is, of course, on poor lands, when nearly in a natural state, that the effects of lime are most striking. Such lands may be increased, by this one operation, eight times in money value, or from 5s. to 40s. per acre. Lands fully supplied with manure have been found, in many cases, to derive no benefit from the addition of lime. This is the case, for example, with the fields around Edinburgh. They probably derive a sufficient quantity of this substance from the street manure, which is principally employed

in fertilizing them. It cannot be affirmed that the theory of action of lime is yet thoroughly understood. There is e likelihood that some of its operations are so latent and diffi of appreciation, that they have hitherto eluded the searcl scrutiny of the chemist. There can be little doubt, howe that there are, at least, four distinct purposes which it serve a chemical constituent of the soil. 1°. It supplies a kind of organic food, which appears to be necessary to the hea growth of all our cultivated plants. 2°. It neutralizes acid stances, which are naturally formed in the soil, and decomp or renders harmless, other noxious compounds, which are unfrequently within the reach of the roots of plants. 3 changes the inert vegetable matter in the soil, so as graduall render it useful to vegetation. 4°. It causes, facilitates, or ables other useful compounds, both organic and inorganic, t produced in the soil, or so promotes the decomposition of e ing compounds, as to prepare them more speedily for ente into the circulation of plants. All these modes of action author illustrates in detail, and the perusal of these illustra will go far to enable the farmer to understand the causes of truly wonderful results which often arise from the judicious of this substance. It is much to be regretted that the abs of limestone in many districts, or the want of coal to bu where it does exist, so often limits the use of it, by increasing expense.

Next to lime, perhaps, there is no manure which has attended with more striking effects, at least in turnip husbar than crushed bones. Perhaps, in this case also, we are not condition fully to explain the mode of action; the difficul doing so may be inferred from the different opinions that been held on the subject. "Some regard the phosphate of or bone earth as the only source of the benefits derived them. Others, again, attribute the whole of their influen the organic part—the gelatine—which bones contain. Nei of these views is strictly correct. Plants require a certain q tity of phosphoric acid, lime, and magnesia, which are prese the inorganic part of bones, and so far, therefore, are capabl deriving inorganic food from bone-dust. But the organic pa bones will decompose, and, therefore, will act nearly in the s way as skin, wool, hair, and horn do, which substances it sembles in ultimate composition. It cannot be doubted, th fore, that a considerable part of the effect of bones upon all c must be due to the gelatine they contain.—(P. 655.) He candidly weighs all the considerations connected with this ject will, I think, conclude that the whole effect of bones can n any case, be ascribed exclusively either to the one o he other of their principal constituents. He will believe, ind

at in the turnip husbandry the organic part performs the most rominent and most immediately useful office, but that the arthy part, nevertheless, affords a ready supply of certain inoranic kinds of food, which in many soils the plants would not therwise easily obtain. He will assign to each constituent its eparate and important function, being constrained at the same ime to confess that, while, in very many cases, the *earthy part f bones applied alone* would fail to benefit the land, there are few ultivated fields in which the *organic part applied alone* would not aterially promote the growth of most of our artificial crops." -(P. 660.)

The fourth part of Mr Johnston's work refers to the products f the soil—their composition, their differences, and the purposes hey are intended to serve in the feeding and nourishment of nimals, which completes the view of the whole subject.

But we must bring our remarks to a close. What has been aid, will be sufficient to shew, in some measure, the extent and alue of the information these lectures supply. They give a comlete and comprehensive view of the present state of geology and hemistry as applicable to agriculture; and, while they form a epertory of ascertained facts, they also indicate existing deficiencies, and point out many of the means which these branches f science may yet bring into operation for the benefit of agriculure. That these benefits may be speedily secured, and the sanuine expectations now so generally entertained, especially as egards the chemical department of the subject, fully realized, is ur earnest wish. It cannot be denied that there is need of xertion. We have only to glance at the statistics of our population to perceive in what a rapid ratio mouths are increasing -they must, if possible, be filled. In an insular position like urs, we cannot increase the supply, so as to make it outstrip he demand, by an indefinite extension of the field of produce. t can only be done by the most assiduous improvement within our mited range—by making the most of what we have. The fact is ndubitable, because established by the testimony of the most ompetent judges, that the agricultural produce of extensive disricts of the country, especially of England, may be increased *hree-fold ;* and that by a judicious use of the means which agriulture affords, even in its present condition. Are we not entiled to expect, from the consideration of the prospects which cience now holds out, that the produce even of our best cultiated lands will soon be doubled?

MORE THOUGHTS ON SHELTER.

By Mr Donald Bain, Edinburgh.

In recommending shelter so earnestly as I do, I have four o in view: first, to effect the shelter of the country gen and in that the amelioration of its climate; next, the im ment of particular spots; third, from the mode of eff the shelter, to economize the soil; and, lastly, in the selected, to increase their utility, not merely in their ult use as timber, but even in their interim use as food for gam As already stated, I would turn "every spot of our limited tory, and every blade, and every bough, to its utmost providing food and shelter for man and for beast."

It is unnecessary to say that these objects are desirable; would be so, whatever might be the extent of our territory- situated as we are in a small and not naturally warm or spot, they are indispensable to our prosperity and comfort one will deny that, could this country, or the islands com these kingdoms, be sheltered round, it would be very desi Then we have only to will it; and could our barrens, wl in hill or plain, be turned into fertile places, that would a desirable. Why, then, should we not seek it? Ever acknowledges that much has been done for the plains of Sc in particular, by the judicious conduct of her landlords, a skill and energy of her cultivators, and it is held to redou their credit. I admit and praise it. It makes both of examples to other parts of the kingdom, and, perhaps, to kingdom in Europe, or in the world. But why stop There is still much to be done even in the plains, and th are almost untouched. Except in the feeble and un essays of the individual now writing, there has not be attempt (that he knows of) to lay down a plan for the im ment of the hills; yet they are part, and a large part, soil; and they *are* of our soil, and, therefore, more valuabl than the soil of any other country. They are capable of im ment; their improvement would be profitable; many people are even in want of employment of any kind, an sequently, of the means of living by their own labour; then, should this work be delayed? The consideration would surely be preferable to the consideration of laws for taining, in as miserable a manner as possible, those peo idleness for whom we refuse to find employment—and, f them refractory, at great expense trying, convicting, and e ing them, to improve other countries instead of their own.

re seem not to see this, or, seeing it, we disregard it. The people of China call us "barbarians," and we are very angry, hough, in our hearts, we retort the compliment. Yet, may we not consider this? *They* cultivate every spot of their territories; he highest hills are there cultivated to the tops; where the urface is so steep as to render the growth of useful crops impossible, it is scooped into terraces; where there is no soil, it is arried thither; every particle of manure is used for improving egetation, and every leaf and blade produced is turned to some useful purpose. When, after all this industry on the land, and nearly an equal industry on the waters, they find themselves still oo many for the food they can produce, they yet invade no other country; while we invade every other country, in quest of food or work, leaving our own country only half cultivated. No doubt, we in this do good. By exchanging commodities, even for the ood of other countries, we encourage an increased production in hose countries; but would it not be wise, at the same time, to cultivate as well as we can at home? This is what I contend for.

I have assumed, at the same time, and I think rightly, that, in this country, and, in particular, in its hills and barrens, nothing s more necessary than shelter, though draining, and manure, and cultivation generally, may be *as* necessary. I have said that, as agriculture is only gardening on a large scale, so we should shelter all crops as sedulously, to the extent necessary to their perfection, as we do the crops of gardens, and all animals eeding on them, so far as necessary to *their* comfort, as we do y the inhabitants of menageries.

For sheltering the country generally, I recommended marginal woods, always taking advantage of natural heights, and where here were no heights, creating them. A grove placed upon a height not only shelters to the extent of its natural height, but, by increasing the angle, sends the blast upwards, instead of permitting it to deflect or go onwards, and thus might shelter for miles inward, where a shelter injudiciously placed might hardly helter at all. At the same time it would create no closeness. It would be like a natural swell of the country, but infinitely more powerful than any natural swell; for, being abrupt, it would act decidedly, and not suffer the blast again to creep downwards.

For sheltering particular spots, I recommended defences similarly proportioned, though not on so large a scale.

To economize the soil where valuable, I gave examples, from actual and successful practice in England, of planting the trees hinly, but in alternate rows; the tree in one row being always opposite the opening in the other. In this way I *shewed* that ot only might a shelter be effected, enhancing exceedingly the

value of the inclosed land, whether for pasture or for cultivation, but enhancing, in an equal degree, the land on which the shelter was raised; the pasture under and about the trees being improved as much as that which was within them; and the trees being thus not only a clear gain in themselves, but infinitely more valuable as the nurses of other crops.

I suggested that, though continuous woods might be better than continuous wastes, yet that woods should, if possible, be planted, not as crops themselves, and consequently in large and unbroken fields, but as the nurses of crops, that is, as shelters merely. Of course, there are grounds so rough and remote as to be incapable of cultivation; but we can hardly conceive any grounds in which patches of large extent might not occur well suited for pasture, and which, being surrounded and sheltered by woods, might be exceedingly increased in value in that character. Therefore, wherever an extent of pasture-land could be found, it should be preserved and environed with wood for shelter, not covered by it.

On the same principle, it occurs to suggest that, wherever woods have been planted to an injudicious extent, the first proper opportunity should be taken to reduce that extent, by removing the trees from all such portions as might be more profitably occupied, whether for cultivation or in pasture, either by transplanting the trees if they are young, or cutting them down if they are of saleable size.

On precisely the same principle, I would recommend that, where woods are to be cut down for their value as woods, still a remnant might be saved for the purposes of ornament or of shelter. This might be done with infinitely more profit than can by any possibility accrue from their complete removal. Mr Wilson, in his "Voyage Round Scotland," (a book which will be afterwards adverted to,) says, on coming to Salen in Morven, "the proprietor of the woods (of natural birch) has agreed to deliver them at the mill-door for seven shillings a ton," for the purpose of being converted into pirns for cotton. "This bargain," (it is continued,) "may be good or bad; but whoever may have seen, as we did, the splendid crags and the fair silvery stems of that most beautiful of forest trees, might have agreed almost to go with stockings undarned, rather than such desolation should be occasioned."

Of course the same appearance of desolation ensues from the cutting down of young oaks for their bark, or of any other species of wood. By preserving here and there borders, even of the least valuable part of the wood, not only might this appearance of desolation be evaded, but a valuable purpose would be served.

A shelter would be kept up of the greatest consequence to the future crops of the ground cleared, whether these should be grass or corn, or even again natural or planted wood.

In regard to hills and mountains, I suggested that shelters should be effected, either by taking advantage of natural eminences, or by leading belts up the sides of the mountains, in the directions best calculated to avert the prevailing blasts; or by circles of planting, at such distance as that the one circle should shelter the space between it and the next, always leaving openings for the flocks to range as freely as might be desired, and always adapting the trees to be planted to the nature of the soil and climate, and, if possible, also to the exigencies of the spot, so as to render the trees useful as timber, whenever they should reach that point.

I can add nothing to this, beyond recommending, in these and in all circumstances, that regard should be had also to the nature of the seeds, or tops, or leaves of the shrubs or trees, as food for cattle, or the more useful species of game.

I already stated, for example, that the whin and broom, particularly when growing *fine*, that is, in sheltered situations about the dykes or outskirts of plantations, might be made in the last degree useful for sheep in winter, particularly in snow storms, when grasses cannot be got at even in sheltered situations, or, being got at, are dangerous from being mingled with ice or snow. The tops of various firs are useful to the larger game; that, therefore, should give them a claim to preference over simply sheltering trees. The fruit of the wild cherry, the mountain ash, &c., must be also useful. In the lower grounds, and around residences, the chestnut, acorn, beechmast, hazelnut, and a variety of other seeds and fruits of trees, must be useful; and I have lately noticed the following, even as to the horse chestnut, the most graceful, but hitherto, as to its fruit, considered the most useless of trees.

"Whilst I was at Geneva, in the autumn of 1837," (says a writer in *The Elysee*,) "I observed every one collecting carefully the fruit of the horse chestnut, and, upon inquiry, I learnt that the butchers and holders of grazings bought it readily at a certain price per bushel. I inquired of my butcher, who himself held an extensive grazing farm, what was the object of this, and he told me that it was given to those sheep, in particular, that were fattening. The horse chestnuts were well crushed, something in the way, as I understood, that apples are, previous to cider being made. They are crushed or cut up in a machine in Switzerland kept solely for that purpose, and about two pounds weight is given to each sheep morning and evening. Sheep eat it greedily; but it must be portioned out to them, as too much would disagree with

them, it being of a very heating nature. The butcher told me that it gave an excellent rich flavour to the meat—and the Geneva mutton is noted for being as highly flavoured as any in England or Wales."

Now, we know that sheep eat the horse chestnut even when not crushed; but many hundred tons of it are annually lost even in Scotland from their having no access to it, or its being uncrushed. Many other fruits and leaves also, doubtless, might be found useful, were they carefully examined and their properties ascertained. While we are constantly amusing ourselves in crossing tulips and roses, I have felt surprised our horticulturists have never thought of improving the properties of useful plants, many of which might certainly be exceedingly improved. Sheep, for example, like herbs, &c., that are heating in their qualities, as is seen even in the case of the horse chestnut. Could the qualities of the turnip or the ruta baga (which, I believe, is not a turnip, though used as such) and the radish be in any degree combined, sheep would doubtless prefer this compound to either of the simple plants; and as these are the days of improvement, some inquiries of this description should, I think, be instituted. Trees naturally very useless too might, doubtless, be made useful, in close and warm situations, by *graffing*. In short, in all situations, whether in the wilds or round residences, gentlemen should have the following objects in view in every plant directed by them:—First, shelter, which, being indispensable, may leave no choice as to the trees to be selected, except their capabilities for that; next, utility as timber; third, as the food of game or other animals; and that trees merely ornamental should scarcely cumber the ground.

But I was particularly earnest as to the culture of the hills; and if the extent of the subject is considered, and consequently its importance, hardly any degree of earnestness can seem unjustified. They contain many millions of acres: that will be admitted. The total number of acres in Scotland, England, and Ireland, and the islands adjoining, being 78,350,000, the unimproved amount at this moment to upwards of 31,000,000, or greatly more than one-third of the whole; and of these about 16,000,000 are declared "incapable of improvement," being (I can conceive no other cause) too high and bare.

Of these I would deduct 500,000, not as useless, for they may be composed of building or iron stone, quartz, lime, slate, &c., and so more valuable, acre for acre, than the others; but I would deduct them as unfit for cultivation or pasture, and so only 15,500,000 will remain. I shall suppose that these are greatly too high and rough to be cultivated continuously; and in their present situation producing very little in summer, and nothing whatever in winter but cold. It would be a great and

ble triumph if these circumstances could be reversed; and rgument is, that they could be so. It has been already d and shewn, in the course of these essays, that hills equally and barren have been covered to the tops with wood, by rinciple of planting belt after belt, as the lower became le of sheltering the higher; and wood is both more pleasd profitable than merely barren heights. Had the princien adopted, or were it still adopted, of leaving spaces for re between these successive belts of wood, these hills would rered with alternate rings of wood and pasture; and as are few if any hills in Scotland that can be considered to the regions of perpetual snow, it is very possible that the it part of the pasture so sheltered, would be nearly as good lowest, at least in many spots; for the scourging process t present sweeps the soil of the higher parts of mountains lower, would cease, and every year the soil of the whole be increased, by the growth and decay of vegetable matiere, at present, there is little of either. Well—either as or as pasture, or both combined, these 15,500,000 es would be rendered valuable so far in themselves, istead of increasing the cold of their neighbourhood, by lering snow, and, consequently, freezing winds, they would m in themselves, and a source of shelter and warmth to ieighbourhoods.

I have never contemplated woods merely, or pasture ; I have always contemplated that the woods should be ed in some degree pasturable, as well as useful to other ements; and that the pastures should be improved by cultivation. Even in the hills I would plant no hollow or iurface that might either be improved into good pasture lter, or, from its form and nature, might be improved by neans. Wherever there were a considerable extent of ;, bearing perhaps a coarse inedible grass, I suggested the ment of the mountain plough, so as to increase and imhe quality of the natural product; or the introduction of e and seeds, if that should seem proper. If there were a I suggested its draining; a pool, its outlet; a bog, also ining, and the application of a little lime. I suggested ie introduction of cottages and people, however far in the follow up such operations, and to form rendezvous for ep and cattle in storms, or at yeaning time, &c. I sugwhen possible, the regular cultivation of barley, or any rop capable of being produced abundantly, not for the e of being ripened as food for man, but of increasing the t of food for sheep or cattle. Upon the same principles, ses or other vegetables might be cultivated, not so as to

bring them to perfection in the usual manner, but so increase the flush of food. This cultivation need not be co ous—its ultimate effect would be the same however det: Yet if the shepherds, or hill-servants, were industrious, a mulated by a regard to the interests of their employers, (might be made to unite with their own,) those improved would continually extend, and, doubtless, also improve in c ter, till very few spots might at last be found in which the of man could not be traced.

I, of course, contemplate especially the augmentation o ture and shelter for cattle and sheep only; but winged ga particular might be combined. In these high and r woods, thousands of head of the most valuable game mig generated, always adding to the food of the country; a grains, seeds, &c., which would be so useful to them, deduct very little from the value of the grains and gras other animals; while the seeds and tops of the trees wo clear additions to the available produce of the soil. And, deer parks be in any case effected, it would be better for animals, and more for the interest of their owners, to patches of ground provided for them in the woods, as well pheasants, than to leave it necessary for them to prey upo farmers in their neighbourhood, exposed to all the dang retaliation at their hands, and accompanied by large de for damages for crops destroyed. It is almost discred indeed, to contemplate a deer park or a pheasantry, w making suitable provision for them within their own dom for, though both may draw much from well established f they are also fond of corn, and, unless it is provided, the g tous invasion of the neighbouring fields must be contem In short, with proper and systematic views, zealously c into effect, there is hardly any portion of these island might not be made productive, for one purpose or anothe very great extent. We are thinning our hills of people- brave and hardy people—attached to their country with inclemencies, and not easy to be replaced. I would not again peopling the hills by frequent townships, as was on case; but I certainly think that the introduction of so hardy and industrious men, as foresters and hill-labour might carry out these views of arboreal and pastoral im ment, would be one of the wisest things that could be d upon, before the race becomes too much reduced. Of c they should be trained to their callings, as gardener farmers are, and thoroughly imbued with the spirit of the sure. In this view, I need not say that comfortable sh should be provided for them and their families, and all ra

ans and inducements to act with zeal and effect; and, if so, t only should we soon see the face of the country changed, d many of those connected with it exceedingly enriched, but e should soon have even a new and superior race of men. For, the strength of constitution and habits of endurance natural our Highlanders, these men would add the activity and intelgence of the inhabitants of the plains; and by constant drafts the hills of Lowland herdsmen or labourers, the habits and nstitutions of many of the Lowlanders would be rendered qual to those of the natives of the hills.

In all this there is no tincture of enthusiasm; the results escribed are plain to the most sober capacity. No one will eny that woods will shelter; no one will deny that shelter nproves both soil and climate, and, consequently, the natural roducts of both; no one will deny that, in this way, the proucts of the highest hills in Scotland might be both improved in uality and enlarged in quantity, to an extent at present scarcely onceivable; the highest grounds, by being environed with oods, being converted into sheltered valleys—and in this my ase is made out. I can fancy the very highest hills of Scotland, hus treated, improved, as I have mentioned; where at present arest, rendered productive of the finest pasture; sheltered cotages smoking, where, at present, the eagle can seldom rest, and he stout shepherds, descending with their little alpine steeds, oaded with game, or driving before them hundreds of the finest heep or cattle, from regions at present abandoned to the goat r eagle, and very thinly frequented even by them.

Would not this be desirable? Is not this practicable? I hall shew, before concluding, that it is both practicable and lesired. The blame, therefore, of not proceeding must rest with he landlords or their representatives—a degree of responsibility o onerous as not, I think, to be trifled with; or, if so, in the ast degree discreditable to the name and office of landlords. I lo not say that this should be rushed into at once on a large cale; there may be many impediments to this. But, at least, he scheme should be considered, and, if approved, proceeded in o a rational extent; and, in all events, farther progress in error hould be avoided, by overplanting just as much as heretofore we ave underplanted; covering whole districts with wood, where hree-fourths might have been devoted to cultivation or pasture; nd thus, at the sametime, making the woods *noxious*, and the lestroyers of soil and climate, by absorbing the one and renderng the other intolerable, from damps and fogs, instead of, as hey might be, at once an ornament and unspeakable benefit, a ource of wealth and comfort, to the landlord and the country.

In almost all this I have been contemplating chiefly the recla-

mation of the 15,500,000 acres declared to be "incapable of improvement," and of which Scotland contains upwards of 8,500,000, or more than one-half; England, about 3,000,000; Ireland, 2,500,000; Wales, 1,000,000; and the islands, the remaining 500,000. But there is also precisely as much "considered reclaimable," on usual principles, but *not reclaimed*, of which Scotland contains about 6,000,000 of acres; England, 3,500,000; Ireland, 5,000,000; Wales, 530,000; and the islands 170,000. For these last, draining, manure, and cultivation, on the usual principles, would, perhaps, be chiefly necessary, though I have assumed that a degree of shelter would be necessary for all.

But so vague are the terms used, that it is not easy to discover if these "wastes, capable of improvement," do not comprehend in Scotland the most of the pasture-lands, and in England and Ireland, &c., the same. If that is the case, one-half, at least, or 7,500,000 acres might be added to the cultivable land, and the entire remainder to the improved pastures, raising these last to 23,000,000 of acres; and when the *immense addition* that might be made to the entire produce of the country is considered by the superiorly careful cultivation which shelter would both indicate and excite, the importance of the subject is almost overwhelming. It is not the addition to *rent* that we have to consider, but the *produce*, however created; and when it is considered that the rents of sheltered lands have been raised from pence to pounds, even on the present imperfect principles, (by which I mean partial and unsystematic,) I cannot but think that, under a general and systematic movement, the entire climate would be so much improved, and cultivation rendered so careful, that the total result can scarcely be anticipated.

In the meantime, what an additional amount of labour and income would not this resort to a liberal and rational system of husbandry generally, create especially in England and Ireland. In my last paper, I have brought under notice a vivid instance of the success of the farmers of small patches of moor lands, in reclaiming their possessions, and comfortably maintaining themselves and their families, upon spots which, in their natural state, were absolutely barren; and these, I think, are proper arrangements in these circumstances and in this country; because there is no Scotchman who, however comfortable on such a patch, from an interim inferior rent, would think of bringing up his son to a similar dependence, unless it offered a rational prospect of comfort; and he would never think of so devoting more than one. In Ireland, the same principle might be eminently successful on *the same understanding*, that is, that the hill-farms should never be lessened, but rather in due time increased. I, many years ago also pointed out the propriety of giving some hold of the

›il to the inhabitants of *manufacturing villages*, by giving ›em patches in their neighbourhood, either to reclaim for themelves or for healthful amusement at all times, and employment nd partial subsistence when trade might be slack. In this ay, I have said, "in moors originally *barren*, in spots where *ock* or *stone* infinitely preponderated over the poorest soil, and n being dug up, *absolutely covered it to the depth of twelve or burteen inches;* in mosses or bogs almost entirely valueless, cornields have been created." These fields, I continued, "have nother value in connection with manufacturing villages, they ender the occupants more independent of casual stagnations in rade; for the patch of land, that in prosperous times is an musement only, is a *refuge* in adversity; and, with only half vork or wages, enables them to weather the blast." In neither f these cases is there a danger of creating a redundant populaion, or of withdrawing the attention of the individuals from their roper business, at least to the prejudice of any others than hemselves. But I cannot think equally well of patches to agriultural labourers, as is proposed in England, seemingly with the iew of rendering them less dependent on labour on farms, and hus either to create superfluous labourers, or give farmers the enefit of their services on inadequate terms. Both these objects re bad. If farmers cannot afford to pay their servants adeuately, it is clear they ought not to continue to occupy their arms; or if farm labourers are too numerous, the object should e, *not* to endeavour to provide for them in misery, but to reduce heir number. This patching and peddling is sure to increase he ill it would cure. It is but another mode of reducing holdgs, and increasing the amount of superfluous labour. My plan f inclosing and extending cultivation, whether on the great ale or the small, would be increasing labour and income, not ividing the existing income upon a new principle; nor calling up e additional hand, without an additional and enduring object.

I therefore trust the scheme will have a trial. Its profits ould far exceed the profit of any business we can raise, by duly pressing our labours upon other countries; for every illion drawn from our *own* soil, to a like extent gives us a sure d an internal trade. It would absorb much labour at present nning waste, or at least adding little to the comfort of the dividuals. Being a home labour, it would be infinitely more greeable to our people than emigrating; it would add much to e beauty, the comfort, the strength, and the wealth of the untry; and in all these, in one word, to its prosperity.

Here I again pause; and if the possessors of wastes in the owlands shall continue contented to remain the possessors of astes, with the examples of successful cultivation before them

which I have shewn; or the possessors of hill or mountain lands shall continue contented with seeing them in a state of nature, while every other spot on which industry can be expended with the hope of a return, is cultivated, I shall be surprised. With the very same propriety might we neglect *everything* or *anything*. At one time there was no cultivation whatever, but surely *that* is not now approved? The *reverse* of it is approved; and, that principle duly carried out, *there should now be no spot without cultivation*, at least of the character suited to the spot. I consider that I have opened up a field so cheering to the landlord and the country, that the possessor of the poorest land should feel elevated, and the country itself strengthened, by the immense accession opened to its industry and offered to its resources.

Meantime the inhabitants of bare and cold quarters of the country, or of regions infected by damp, should pray for shelter and draining as they do for their daily bread, for they are synonymous; and not only with this, but with health and comfort.

THE AGRICULTURE OF DIFFERENT AGES AND COUNTRIES.

By Cuthbert W. Johnson, Esq. F.R.S.

The state of mankind, in the earliest periods of their social existence, is commonly one of idleness. A scantily populated, fertile country, is ever distinguished for the rudeness of its cultivation and the comparative inferiority of its produce. In the first ages of mankind, and, in fact, in that of newly-peopled countries, the wants of the first settlers are usually too readily supplied to render much exertion necessary. The rich alluvial soils, fertile without manure, productive of the finest grass without labour, are the first spots on which the new comers locate themselves. These supply food for their live-stock, and corn and vegetables for the owner's family, with the least labour; and if the settler is not tempted, by the high price it bears, to grow more corn than is sufficient for his own wants, he devotes himself to the delights of the chase—his gun, his fisheries, his dogs, supply him with abundance of game, with his food, and with skins for his clothing. Thus employed, thus readily supported, it need hardly surprise us that, in the rudest state, these occupations are ever regarded as the only occupations worthy of man, and that to the weaker sex is committed the care of the garden and the cultivation of the field. The foresight exercised [in] these matters, by such primitive cultivators, is ever in keeping

ith the rest of their proceedings. Thus the islanders of the uthern Ocean, being devoid of tools, were accustomed to estroy by fire the noblest trees, to produce a wretched unwieldy anoe. To acquire the fruit of the bread-tree, the natives had o better expedient than to burn the tree down; and when the rientalists found out the advantages of growing corn, it was ong before they discovered a mode of thrashing it. To tread it ut by the feet of oxen was regarded as the most reasonable ay of separating it from the straw—a plan still followed even n Portugal. The progress of agricultural implements betrays he same indolence and carelessness. The plough, for instance, n some rude form or other, is an agricultural implement of emote antiquity; but it was long used of such a form as produced bad work, and very unnecessary labour to the poor beasts who were fated to draw it along. Plough-harness was another difficult question which long puzzled the primitive cultivators of he soil. Thus the poor Irish boors for ages fastened their horses o the plough by their tails, and when, at last, an act of the rish Parliament prohibited the barbarism, it was regarded by he then tillers of the soil as an interference of the legislature otally uncalled for. It was said to be an act which violated hat freedom of action, and was an interference with that great narch of experimental improvement, for which our gallant neighbours have ever been so desirous. It will be, perhaps, an interesting, and, at the same time, a research affording us some nstruction, if, previously to entering upon an examination of the different systems of agriculture, produced by the effects of soil and climate, I repeat and enlarge upon what I have, in another place, had occasion to observe upon the farming operations of distant ages.

We have but little information to guide us as to the country n which man first cultivated the soil; nor of that in which he first settled after the Deluge. Thus much, however, is certain, that we have the earliest authentic account of the state of agriculture as it existed among the Egyptians and their bondservants, the Israelites. From the former the Greeks were probably descended. The Romans, at a later period, were a colony from Greece; and from the Romans the other countries of Europe derived their earliest marked improvement in the arts. My brief history of the progress of agriculture, then, will be divided into, 1st, The Agriculture of the Egyptians and other Eastern Nations; 2d, The Agriculture of the Greeks; 3d, The Agriculture of the Romans.

I.—*The Agriculture of the Early Eastern Nations.*

Every family of these primitive nations had its appointed dis-

trict for pasturage, if it pursued a pastoral life; or its allotted inclosure, if it was occupied by tilling the earth. There was no distinction in this respect between the monarch and his people; each had a certain space of land from which he and his family were to derive their subsistence. The Egyptians, as well as the Israelites, were flock-masters. The latter were particularly so; and, as Joseph's brethren said to Pharaoh, "their trade was about cattle from their youth." (*Gen.* xlvi. 34.) When, therefore, they came into Egypt, they desired the low-lying land of Goshen, as producing the most perennial of pasture. (*Gen.* xlvii. 4.) It is true that the same authority says "every shepherd is an abomination unto the Egyptians;" but this was because, about a century before the arrival of Joseph among them, a tribe of Cushite shepherds from Arabia had conquered their nation, and held them in slavery; till, after a sanguinary contest of thirty years, they regained their liberty about twenty-seven years before Joseph was promoted by Pharaoh. That the Egyptians were flock-masters is certain from many parts of the Scriptures. Thus, when Pharaoh gave permission to the Israelites to dwell in Goshen, he added, as he spoke to Joseph, "And if thou knowest any men of activity among them, then make them rulers over my cattle," (*Gen.* xlvii. 6;) and when the murrain came into Egypt, it was upon their "horses, asses, camels, oxen, and sheep." (*Exod.* ix. 3.) The attention and care necessary to be paid to their domestic animals were evidently well known and attended to; for when they proposed to settle in a land, their first thought was to build "sheep-folds for their cattle." (*Numb.* xxxii. 16.) They had stalls for their oxen (*Hab.* iii. 17) and for all their beasts. Thus, King Hezekiah is said to have made "stalls for all manner of beasts, and cotes for flocks; moreover, he provided him possessions of flocks and herds in abundance," (2 *Chron.* xxxii. 28;) and that this abundance exceeded the possessions of the greatest of our modern flock-masters, we may readily acknowledge, when we read that "Mesha, King of Moab, was a sheep-master, and rendered unto the King of Israel 100,000 lambs and 100,000 rams, with the wool." (2 *Kings*, iii. 4.)

They prepared the provender for their horses and asses of chaff, or cut straw and barley. (*Judges*, xix. 21; 1 *Kings*, iv. 28.) Our translation does not explicitly state this, but it is clear in the Hebrew original. (*Dr Kennicott's Codex*, xxiv.; *Harmer's Observations*, i. 423.) It is also certain, from the Hebrew original, that they tied up calves and bullocks for the purpose of fattening them, (*Jerem.* xlvi. 21; *Amos*, vi. 4, &c.; *Parkhurst's Hebrew Lexicon*, 673;) and that they were acquainted with the arts of the dairy. "Surely the churning of milk," says Solomon, "bringeth forth butter," (*Prov.* xxx. 31;) and Samuel speaks of

e "cheese of kine." (2 *Sam.* xxvii. 29.) The chief vegetable oducts cultivated by these eastern nations, were wheat, barley, ans, lentils, rye, the olive, and the vine. (*Exod.* ix. 31; *Levit.* ix. 10; 2 *Sam.* xvii. 28, &c.)

The scanty notices which we have of their tillage, gives us no ason to doubt that they were skilful husbandmen. Their name r tillage (*Obed*) emphatically expresses their idea of it; for it terally means *to serve the ground.* (*Parkhurst*, 508.) And that e cares and attention necessary were well sustained, is evienced by the fact that David, for his extensive estate, had an verseer for the storehouses in the fields; another over the tilge of the ground; a third over the vineyards; a fourth over e olive trees; two to superintend his herds; a seventh over his mels; an eighth to superintend his flocks; and a ninth to tend similarly to the asses. (1 *Chron.* xxvii. 25—31.) Of their oughing, we know that they turned up the soil in ridges, simirly to our own practice; for the Hebrew name of a husbandan signifies a man who does so. (*Parkhurst*, 93.) That they oughed with two beasts of the same species attached abreast the plough. (*Deut.* xxii. 10.) That the yoke, or collar, was stened to the neck of the animal; and that the plough, in its ode of drawing the furrows, resembled our own; for we read of eir sharpening the coulter and the ploughshare. (1 *Sam.* xiii.), &c.) Ploughing was an operation that they were aware ight be beneficially performed at all seasons; for Solomon menons it as a symptom of a sluggard, that he will not plough in e winter, (*Prov.* xx. 4;) and that too much care could not be evoted to it, they expressed by deriving their name for ploughg from a Hebrew root, which signifies *silent thought and atten-on.* (*Parkhurst*, 244.)

Their sowing was broadcast, from a basket, (*Amos*, xi. 13; *salm* cxxvi. 6;) and they gave the land a second superficial loughing to cover the seed. It is true that harrowing is menioned in our translation, (*Job*, xxxix. 10;) but Schultens and ther Hebraists agree that harrowing was not practised by them. Russell, in remarking upon the mode of cultivation now practised ear Aleppo, says, "No harrow is used, but the ground is loughed a second time after it is sown, to cover the grain." *Parkhurst*, 720.) The after cultivation apparently was not eglected: they had hoes or mattocks which they employed for xtirpating injurious plants. "On all hills," says the prophet, 'that shall be digged with the mattock, there shall not come hither the fear of briars and thorns." (*Isa.* vii. 25.) In those ot climates a plentiful supply of moisture was necessary for a ealthful vegetation; and the simile of desolation, employed by he same prophet, is "a garden that hath no water." (*Isa.* i. 30.)

In Egypt they irrigated their lands; and the water thus supplied to them was raised by a hydraulic machine, worked by men in the same manner as the modern tread-wheel. To this practice Moses alludes, when he reminds the Israelites of their sowing their seed in Egypt, and watering it with their feet, a practice still pursued in Arabia. (*Deut.* xi. 10; *Niebuhr*, *Voyage en Arabie*, i. 121.)

When the corn was ripe, it was cut with either a sickle or a scythe, (*Jer.* l. 16; *Joel*, iii. 13,) was bound into sheaves, (*Psalm* cxxix. 7; *Deut.* xxiv. 19, &c.,) and was conveyed in carts, (*Amos*, ii. 13,) either immediately to the thrashing-floor or to the barn. They never formed it into stacks as we do. The passages in the Scriptures (*Exod.* xxii. 6; *Jud.* xv. 5; *Job*, v. 26) refer exclusively to the thraves or shocks in which the sheaves are reared as they are cut. (*Harmer's Observ.* iv. 145, &c.) The thrashing-floors, as they are at the present day, were evidently level plats of ground in the open air. (*Jud.* vi. 37; 2 *Sam.* xxiv. 18—25, &c.) They were so placed that the wind might, at the time of the operation, remove the chief part of the chaff. They perhaps had thrashing-floors under cover, to be used in inclement seasons; for Hosea, (ii. 35,) speaking of "the summer thrashing-floors," justifies such a surmise. The instruments and modes of thrashing were various. They are all mentioned in these two verses of the prophet: "Fitches are not thrashed with a thrashing instrument, neither is a cart-wheel turned upon the cummin; but the fitches are beaten out with a staff, and the cummin with a rod. Bread-corn is bruised because he will not ever be thrashing it, nor break it with the wheel of his cart, nor bruise it with his horsemen." (*Isaiah*, xxviii. 27, 28.) When the seed was thrashed by horses they were ridden by men; and when by cattle, although forbidden to be muzzled, (*Deut.* xxv. 4,) yet they were evidently taught to perform the labour. (*Hosea*, x. 11.) The "instrument" was a kind of sledge, made of thick boards, and furnished underneath with teeth of iron. (*Isaiah*, xli. 15; *Parkhurst*, 242, 412.) The revolving wheels of a cart, and the various sized poles employed for the same purpose, need no further comment. To complete the dressing of the corn, it was passed through a sieve, (*Amos*, ix. 9,) and thrown up against the wind by means of a shovel. The fan was, and is still, unknown to the Eastern husbandmen; and where that word is employed in our translation of the Scriptures, the original seems to intend either the wind or the shovel.* (*Isa.* xxx. 24; *Jer.* xv. 7; *Parkhurst*, 183, 680.)

Of their knowledge of manures we know little. Wood was so scarce that they consumed the dung of their animals for fuel. (*Parkhurst*, 764.) Perhaps it was this deficiency of carbon-

us matters for their lands that makes an attention to fallow- so strictly enjoined. (*Levit.* xix 23, xxv. 3; *Hosea*, x. 12, &c.) The landed estates were large, both of the kings and of some heir subjects; for we read that Uzziah, King of Judah, "had ah both in the low country and in the plains; husbandmen, , and vine-dressers in the mountains and in Carmel, for he od husbandry," (2 *Chron.* xxvi. 10;) that Elijah found Elisha h twelve yoke of oxen at plough, himself being with the lfth yoke, (1 *Kings*, xix. 19;) and that Job, the greatest man the East, had 14,000 sheep, 6,000 camels, 1000 yoke of oxen, . 1000 she-asses. (*Job*, i. 3; xliii. 12.) Even in the time of iah, the accumulation of landed property, in the hands of a proprietors, was so much on the increase, that a curse was red against this engrossment. "Wo unto them," says the phet, "that join house to house, that lay field to field, till re be no place, that they may be placed alone in the midst of earth." (*Isaiah*, v. 8.)

II.—*The Agriculture of the Greeks.*

griculture was too important and too beneficial an art not lemand, and the Greeks and Romans were nations too polished discerning not to afford to it, a very plentiful series of pre- ng deities. They attributed to Ceres, as their progenitors, the ptians, did to Isis, the invention of the arts of tilling the Ceres is said to have imparted these to Triptolemus of isis, and to have sent him as her missionary round the world each mankind the best modes of ploughing, sowing, and reap- In gratitude for this, the Greeks, about 1356 years before Christian era, established, in honour of Ceres, the Eleusinian teries, by far the most celebrated and enduring of all their gious ceremonies; for they were not abolished at Rome until close of the fourth century. Superstition is a prolific weak- , and consequently, by degrees, every operation of agricul- , and every period of the growth of plants, obtained its pre- ng and tutelary deity. The goddess *Terra* was the guardian he soil; *Stercutius* presided over manure; *Volutia* guarded crops whilst evolving their leaves; *Flora* received the still e watchful duty of sheltering their blossom; they passed to guardianship of *Lactantia* when swelling with milky juices; *igo* protected them from blight; and they successively became care of *Hostilina* as they shot into ears; of *Matura* as they ned; and of *Tutelina* when they were reaped. Such creations 'olytheism are fables it is true, yet they most please by their ance, and much more when we reflect that it is the concur- testimony of anterior nations, through thousands of years, they detected and acknowledged a Great First Cause,

Unlike the arts of luxury, agriculture has rarely, if ever, been subject to any retrograde revolutions. Being an occupation necessary for the existence of mankind in any degree of comfort, it has always continued to receive their first attention; and no succeeding age has been more imperfect, but in general more expert, in the art than that which has preceded it. The Greeks are not an exception to this rule; for their agriculture appears to have been much the same in the earliest brief notices we have of them, as the husbandry of the nation of which they were an offset. The early Grecians, like most new nations, were divided into but two classes—landed proprietors, and helots or slaves; and the estates of the former were little larger than were sufficient to supply their respective households with necessaries. There was, probably, not even a prince or leader of the Greeks who did not, like the father of Ulysses, assist with his own hands in the operations of the farm. (*Odyss.* i. xxiv.) Hesiod is the earliest writer who gives us any detail of the Grecian agriculture. He appears to have been the contemporary of Homer, and, in that case, to have flourished about nine centuries before the Christian era. His practical statements, however, are very meagre. Xenophon died at the age of ninety, 359 years before the birth of Christ. The following narrative, if not otherwise specified, is taken from his *Œconomics*. In his time, the landed proprietor no longer lived upon his farm, but had a steward, as a general superintendent, and numerous labourers, yet he always advises the master to attend to his own affairs. "My servant," he says, "leads my horse into the fields, and I walk thither for the sake of exercise in a purer air; and when arrived where my workmen are planting trees, tilling the ground, and the like, I observe how everything is performed, and study whether any of these operations may be improved." After his ride, his servant took his horse and led him home, "taking with him," he adds, "to my house, such things as are wanted; and I walk home, wash my hands, and dine, of whatever is prepared for me, moderately." "No man," he continues, "can be a farmer till he is taught by experience; observation and instruction may do much, but practice teaches many particulars which no master would ever have thought to remark upon." . . . "Before we commence the cultivation of the soil," he very truly remarks, "we should notice what crops flourish best upon it, and we may even learn from the weeds it produces what it will best support. Fallowing or frequent ploughing in spring or summer is of great advantage." And Hesiod advises the farmer (*Works and Days*, 50) always to be provided with a spare plough, that no accident may interrupt the operation. The same author directs the ploughman to be very careful in his work. "Let him," he says, "attend to his

ployment, and trace the furrows carefully in straight lines, not king around him, but having his mind intent upon what he is ng." (*Ibid.* 441–443.)

Theophrastus evidently thought that the soil could not be ughed and stirred about too much, or unseasonably; for the ect is to let the earth feel the cold of winter and the sun of nmer, to invert the soil, and render it free, light, and clear of weeds, so that it can most easily afford nourishment. (*De usis Plant, lib.* iii., c. 2, 6.) Xenophon recommends green nts to be ploughed in, and even crops to be raised for the purse; "for such," he says, "enrich the soil as much as dung." also describes the properties which render dung beneficial to getation, and he also dwells upon composts. (*Hist. of Plants,* c. 8.) Xenophon recommends the stubble at reaping time be left long, if the straw is abundant, "and this, if burned, l enrich the soil very much, or it may be cut and mixed with dung." "The time of sowing," he adds, "must be regulated the season, and it is best to allow seed enough."

Weeds were, even then, carefully eradicated from amongst ir crops; "for, besides the hindrance they are to the corn, or er profitable plants, they keep the ground from receiving the nefit of a free exposure to the sun and air." Homer describes ertes as *hoeing* when found by his son Ulysses. (*Odyss.* xxiv., 6.) Water courses were made to drain away "the wet, which apt to do great damage to corn."

Homer describes the mode of *thrashing* corn by the trampling oxen, (*Iliad*, xx., 495, &c.;) and, to get the grain clear from straw, Xenophon observes, "The men who have the care of work, take care to shake up the straw as they see occasion, nging into the way of the cattle's feet such corn as they observe remain in the straw." From this author, and from Theorastus, we can also make out that the Greeks separated the ain from the chaff by throwing it with a shovel against the nd.

III.—*The Agriculture of the Romans.*

It is certain that, at a very early age, Italy received colonies m the Pelasgi and Arcadians, and that, consequently, with m the arts of Greece were introduced; and we may conclude t there was then a similarity in the practice of agriculture in two countries. About 753 years before the nativity of Christ, mulus founded the city of Rome, whose inhabitants were desed to be the conquerors and the improvers of Europe. The man Eagle was triumphant in Egypt, Persia, Greece, Carage, and Macedon; and the warriors who bore it on to victory, these and other countries, being all possessors of land of a

larger or smaller extent, naturally introduced, upon their return, any superior vegetable or improved mode of culture which they observed in the more civilized seats of their victories. Thus the arts of Rome arrived at a degree of superiority that was the result of the accumulated improvements of other nations; and, finally, when Rome became, in turn, the conquered, the victors became acquainted with this store of knowledge, and diffused it over the other parts of Europe. Of the agriculture of the early Romans we know but little; but of its state, during the period of their greatest prosperity and improvement, we have fortunately very full information. Cato in the second, and Varro in the first century before the Christian era, Virgil at the period of that event, Columella and Pliny but few years subsequently, and Palladius in the second and fourth century, each wrote a work upon agriculture, which, with the exception of that by Columella, has come down to us entire.

1. *Size of the Roman Farms.*—When Romulus first partitioned the lands of the infant state among his followers, he assigned to no one more than he could cultivate. This was a space of only two acres. (*Varro*, i. 10; *Pliny*, xvii. 11.) After the kings were expelled, seven acres were allotted to each citizen. (*Pliny*, xviii. 3.) Cincinatus, Curius Dentatus, Fabricius, Regulus, and others distinguished as the most deserving of the Romans, had no larger estates than this. Cincinatus, according to some authorities, possessed only four acres. (*Ibid.*; *Columella*, i. 3, &c.) On these limited spaces they dwelt, and cultivated them with their own hands. It was from the plough that Cincinatus was summoned to be dictator, (*Livy*, iii. 26;) and the Samnian ambassadors found Curius Dentatus cooking his own repast of vegetables in an earthen vessel. (*Plutarch in vita Cato. Cens.*)

Some of the noblest families in Rome derived their patronymic names from ancestors designated after some vegetable, in the cultivation of which they excelled, as in the examples of the Fabii, Pisones, Lentuli, Cicerones, and the like. (*Pliny*, xviii. 1.) In those days, "when they praised a good man, they called him an agriculturist and a good husbandman; he was thought to be very greatly honoured who was thus praised." (*Cato. in Præf.*) As the limits of the empire extended and its wealth increased, the estates of the Roman proprietors became very greatly enlarged; and, as we shall see more particularly mentioned in our historical notices of gardening, attained to a value of £80,000. (*Plutarch in vit. Marius et Lucullus.*) Such extensive proprietors let portions of their estates to other citizens, who, if they paid for them a certain rent, like our modern tenants, were called *Coloni* (*Columella*, i. 7; *Pliny Epist.* x. 24) and *Politores*, or *Partiarii*, if they shared the produce in stated proportions with

he proprietor. (*Pliny Epist.* vii. 30, and ix. 37, &c.) Leases rere occasionally granted, which appear to have been of longer luration than five years. (*Ibid.* ix. 37.)

2. *Distinction of Soils.*—Soils were characterized by six different ualities, and were described as rich or poor, free or stiff, wet or ry. (*Colum.* ii. 2.) The best soil they thought had a blackish olour, was glutinous when wet, and friable when dry; exhaled n agreeable smell when ploughed, imbibed water readily, retaining a sufficiency, and discharging what was superfluous; not ijurious to the plough irons, by causing a salt rust; frequented y crows and rooks at the time of ploughing; and, when at rest, peedily covered with a rich turf. (*Virgil, Geor.* ii. 203, 217, 238, 48; *Pliny*, xvii. 5.) *Vines* required a light soil, *corn* a heavy, eep, and rich one. (*Virg. Georg.* ii. 29; *Cato*, vi.)

3. *Manures.*—The dung of animals was particularly esteemed y the Romans for enriching their soil. "Study," says Cato, "to ave a large dunghill." (*Cato*, v.) They assiduously collected it id stored it in covered pits, so as to check the escape of the rainage. (*Colum.* i. 6; *Pliny*, xvii. 9, and xxiv. 19.) They sowed ilverized pigeon's dung, and the like, over their crops, and mixed with the surface soil by means of the sarcle or hoe. (*Colum.* i. ; *Cato*, xxxvi.) They were aware of the benefit of mixing gether earth of opposite qualities, (*Ibid.*,) and of sowing lupines id ploughing them in while green. (*Varro*, i. 23.) They burnt e stubble upon the ground, and even collected shrubs and the ce for the similar purpose of enriching the soil with their ashes. *Virgil Geor.* i. 84; *Pliny*, xvii. 6, 25.) Pliny also mentions at lime was employed as a fertilizer in Gaul, and marl in the me country and Britain; but we can only surmise thence that ey were also probably employed by the Romans. (*Pliny*, xvii. and xvii. 5.)

4. *Draining.*—The superfluous water of soils was carried off r means both of open and covered drains. (*Colum.* ii. 2, 8; *Pliny*, xvii. c.; *Virg. G.* i. 109.) Cato is very particular in his rections for making them. (*Cato*, xliii. clx.)

5. *Crops.*—They cultivated wheat, spelt, barley, oats, flax, eans, pease, lupines, kidney beans, lentils, tares, sesame, turnips, nes, olives, willows, and the like. To cite the authorities who ention each of these would be needless, for they are noticed in l the Roman writers upon agriculture. Of the relative importnce or proportion in which the crops were profitable to the omans, we have this judgment of Cato: "If you can buy 100 cres of land in a very good situation, the vineyard is the first bject if it yields much wine; in the second place a well watered arden; in the third a willow plantation; in the fourth an olive round; in the fifth a meadow: in the sixth corn ground; in the eventh an underwood; a plantation yielding stout poles for

training the vine; and in the ninth a wood where mast grows." (*Cato*, i.) They made hay, and the process appears to have been the same as in modern times. After being cut, it was turned with forks, piled into conical heaps, and finally into stacks or under cover. But the mowing was imperfectly performed; for, as soon as the hay was removed from the field, the mowers had to go over it again. (*Varro*; *Colum.* ii. 22.)

6. *Implements.*—The plough consisted of several parts: the beam to which the yoke of the oxen was fastened; the tail or handle terminated in a cross bar, with which the ploughman guided the instrument; it had a ploughshare, the share-beam to which it was fixed, and two mould-boards, a coulter, and a plough-staff for cleaning the plough-share. (*Ovid. Pont.* i. 8, 57; *Virg. G.* i. 170; *Pliny*, xvii. 18, 19.) Some of their ploughs had wheels, and some were without coulters and earth-boards. Besides this, they had spades, rakes, hoes, with plain and with forked blades, harrows, mattocks, and similar implements.

7. *Operations.*—*Ploughing* was usually performed by two oxen, though three were sometimes employed. They were yoked abreast, and trained when young to the employment. (*Cicero, in Verr.* iii. 21; *Col.* vi. 2, 10; *Pliny*, xviii. 18; *Virg. G.* iii. 163, &c.) They were usually yoked by the neck, but sometimes by the horns. (*Pliny*, viii. 45; *Colum.* ii. 2.) There was but one man to a plough, which he guided, and managed the oxen with a goad. (*Pliny*, *Epist.* viii. 17.) They sometimes ploughed in ridges, and sometimes not. They did not take a circuit when they came to the end of the field, as is our practice, but returned close to the furrow. They were very particular in drawing straight and equal sized furrows. (*Pliny*, xviii. 19, s. 49.) They seem to have ploughed three times always before they sowed, (*Varro*, i. 29;) and to stiff soils, even as many as nine ploughings were given. (*Virg. G.* i. 47; *Pliny*, xviii. 20; *Pliny*, *Epist.* v. 6.) The furrows in the first ploughing were usually nine inches deep. When the soil was only stirred about three inches, it was called *scarification*. (*Pliny*, xviii. 17–19.) They usually fallowed their land every other year. (*Virg. G.* i. 71.)

Sowing was performed by hand, from a basket; and that it might be performed regularly, the hand moved with the steps. (*Colum.* ii. 9; *Pliny*, xviii. 24.) The seed was either scattered upon the land and covered by means of rakes and harrows, or more commonly by sowing it upon a plain surface, and covering by a shallow ploughing, which caused it to come up in rows, and facilitated the operation of hoeing. (*Pliny*, xviii. 20.) They were particular as to the time of sowing, the choice of seeds, and the quantity sown. (*Varro*, i. 44; *Pliny*, xviii. 24, s. 55; *Virg. G.* i. 193, &c.)

Weeding was performed by hoes, hooks, and by hand. In dry

the crops were watered. (*Virg. G.* i. 106.) If they
d too luxuriant they were fed off. (*Ibid.* 193.)
ing and Mowing were the usual modes of cutting down
n crops, but the ears were sometimes taken off by a
machine, called *batilium*, which seems to have been a
. cart, pushed by oxen through the corn, and catching the
corn between a row of teeth fixed to it, upon the principle
nodern daisy rake. In Gaul, the corn was cut down by
ne drawn by two horses. (*Varro*, i. 50; *Virg. G.* i. 317;
ii. 21; *Pliny*, xviii. 30.) They do not seem to have ever
heir corn into sheaves. (*Colum.* ii. 21.)
shing was performed by the trampling of oxen and horses,
, and by means of sledges drawn over the corn. *Pliny*,
; *Colum.* ii. 21; *Virg. G.* iii. 132; *Tibullus*, i. 5, 22;
i. 52.) The thrashing floor was circular, placed near the
n high ground, and exposed on all sides to the winds.
highest in the centre, and paved with stones, or more
with clay, mixed with the lees of the oil, and very care-
nsolidated. (*Colum.* i. 6; *Varro*, i. 2; *Virg. G.* i. 178;
i. and cxxix.)
ing was performed by means of a sieve or van, and by a
with which it was thrown up and exposed to the wind.
i. 52; *Colum.* ii. 21.) It was finally stored in granaries
ts, where it would keep fifty years. (*Pliny*, xviii. 30;
i. 57.)
nimals.—Oxen, horses, asses, mules, sheep, goats, swine,
geons, pea-fowls, pheasants, geese, ducks, swans, guinea-
nd bees, are mentioned by various authors as products of
nan farms. Directions for breeding many of these are
. the third and fourth books of the Georgics.
is an outline of the Roman agriculture; and in it our
will doubtless find sufficient evidence to warrant them in
g with us, that it was but little different from that pur-
the present farmers of England. We are superior to
our implements, and consequently in the facility of per-
the operations of tillage; we perhaps have superior
s of corn, but we most excel them in our rotation of crops,
the management of stock. We differ from them, also, in
tising the superstitious rites and sacrifices which accom-
almost all their operations, (see *Cato*, cxxxiv. c.;) but
undamental practices of agriculture they were as fully
s ourselves. No modern writer could lay down more
and comprehensive axioms than Cato did in the following
and whoever strictly obeys them will never be ranked
the ignorant of the art. "What is good tillage?" says
est of the Roman teachers of agriculture. "To plough

What is the second? To plough. The third is to manure. The other part of tillage, is to sow plentifully, to choose your seed cautiously, and to remove as many weeds as possible in the season." (*Cato*, 61.)

Such is a rapid sketch of their agricultural knowledge—a knowledge which has since increased, and will be certainly added to by attending to the advice of another of their writers. "Nature," he observes, "has shewn to us two paths which lead to a knowledge of agriculture—experience and imitation. Preceding husbandmen, by making experiments, have established many maxims, their posterity generally imitate them; but we ought not only to imitate others, but make experiments, not directed by chance, but by reason." (*Varro*, i., 18.)

NEW ZEALAND.

There is a mixture of the ludicrous and melancholy in the avidity with which crowds of emigrants of the middle classes flock to a new colony, provided only that they know nothing about it. Each fresh El Dorado eclipses the last. Adelaide is as much superior to all the other Australian colonies as Port Nicholson is to Adelaide and Nelson to Port Nicholson. The land of his adoption, or rather of his temporary sojourn—for almost all promise to themselves a return to England, in the course of a few years, laden with wealth—is painted by the imagination of the intending settler in the most glowing colours, with which the poets were wont to adorn Arcadia and the Hesperides, or recruiting sergeants to blazon forth the merits of their no less favoured Lubberland. For the romantic there are pastoral simplicity and perpetual spring—there, where "Nature, as in her prime, wantons at will and plays her virgin fancies," they are to sit beneath their own vine and their own fig-tree, while, for men of grosser tastes, there are more substantial realities:—streets paved with gold, and pigs running about transfixed with knives and forks, and demanding to be eaten.

Nor can anything be more incongruous than the realities of a settler's life, and the previous habits and occupations of the majority of the emigrants. Bankers' clerks, linen-drapers' assistants, actors, musicians, miniature-painters, surgeons' apprentices, and attorneys' clerks, cigar-smoking dandies, and idlers of every kind, flee in swarms from a market glutted with talent of that description, to towns of bark huts and canvas tents, where, some few years hence, there may be a demand for one-fifth of their

nbers, but where, at present, none are likely to thrive but men sterner metal—blacksmiths, carpenters, masons, and other ificers, agricultural labourers and farmers, who, if occasion quires, will not disdain to put their shoulders to the wheel, d their own plough, reap their own corn, and tend their own cks and herds. The consequences are to many the disap-ntment and ruin which might be anticipated. Jobbing in vn allotments supports this class of emigrants for a time; but en the bubble bursts, and the period arrives that all who uld live in the new colony must labour, then our newspapers m with letters describing the privations of the settler in the st sombre colours, cautioning those who are disatisfied with ir present condition to endure anything at home rather than k to improve it by emigration; and the prospects of the new ony are now as much depreciated as they had been previously sed above their proper level.

At a period like the present, when so many causes are operat- ; to induce multitudes to seek, in new and unoccupied coun-es, fresh fields of enterprise, and those means of improving ir condition which appear denied them at home, it must be ful and interesting to all classes to obtain correct information pecting those countries to which the steps of the emigrant principally directed—their soil, climate, and natural produc-ns, the state of society among the colonial population, the bits and dispositions of the natives, the price of agricultural oduce, and other necessaries, and the cost of labour. To ne is such information of more importance than to the agri-ltural classes, who are, of all others, the most likely to benefit emigration, and on whom the pressure of the times, arising m the improbability of much longer maintaining that restrictive stem on which their engagements have been founded, is falling th fearful severity. The time is come when the soil of the ited Kingdom, to be cultivated with success, must be culti-ted by tenants of capital, and on an improved system. Small cupations, and antiquated modes of half cultivation, will be st to succumb before the competition with which the British mer must henceforth make up his mind to contend; and they ose resources are too slender, or whose prejudices are too at to permit them to adopt that system of effectual culture ich the times require, will do well to betake themselves in ne to some of the colonies, where the capital which is here ufficient to maintain them as tenant-at-will cultivators, scarcely oved above the scale of labourers, will there be ample to ke them cultivating proprietors, and where the rude and austing modes of tillage to which they have been accustomed l be almost too refined for a new colony and a virgin soil.

It will, therefore, be our object to lay before our readers, from time to time, the best accounts that can be obtained of the existing state and prospects of such of our colonies as are best adapted for the resort of British farmers and farm-labourers, commencing, on the present occasion, with New Zealand, as described in a work recently published by Dr Dieffenbach, who went out as Naturalist to the New Zealand Company. From his connection with that company, we were prepared for a very natural bias to paint the prospects of the colony entirely *couleur de rose*. In this, however, we have been agreeably mistaken, and we find the work displaying throughout the greatest impartiality, and a manifest desire to disabuse the public mind of the exaggerated expectations which have been formed on this subject.

The preface informs us that the work was the result of several journeys in New Zealand in 1839, 1840, and 1841, a part of which time was occupied in visiting the Chatham Islands and New South Wales. His researches, he says, would have been more complete had it been in his power to make an entire survey of New Zealand; but circumstances rendered this impossible; and, from the principles which guide the government and the public, he anticipates that we shall be indebted rather to the extension of colonization than to a previous examination for a more intimate knowledge of the country. He claims, therefore, for the volumes before us no other merit than that of giving accurate and unvarnished descriptions of the places which he visited, while, at the same time, he has gone over much ground previously untrodden, having been the first to describe Mount Egmont and other places in the northern parts of the island, and some of the picturesque lakes and thermal springs in the interior. In illustration of the routes pursued, reference is made to a map, compiled, by Arrowsmith, from the author's notes and sketches, which we should have been well pleased to have seen appended to the book, the chief towns, rivers, and mountains of New Zealand not having been included in those works on geography from which, in the days of our youth, we derived our knowledge of that science. Without attempting to follow our author through his adventurous travels, we shall endeavour to lay before our readers, as briefly as possible, by abridgement or extract, information on those points on which it is most important for the settler to be well informed, recommending the entire work to the perusal of every one who may be thinking of making New Zealand his home, or who may have resolved to emigrate, without having determined whither he will direct his steps.

To begin with climate:—

New Zealand, being situated within the temperate zone, although nearer to the equator than Great Britain, possesses, from its peculiar geographical position, a

ily from its being insular, and also from the nature of its surface, a climate so dified as to resemble that of England more nearly than that of any other country m acquainted with. It is moderate in every respect, the range of its temperature, roughout the year and during the day, being very inconsiderable. This is princilly owing to the immense expanse of ocean which surrounds these narrow islands all sides, preserving a temperature little varying, and moderating alike the cold the antarctic regions and the heat of the tropics. * * * The east coast, on ich Wellington, Aukland, and the Bay of Islands are situated, is colder than the uthern, where the settlements of Nelson and New Plymouth have been founded, d where the air is softer and milder. I ascertained this by actual comparison; d, in this respect, the western coast must have great advantages over the eastern. the interior of the islands, the climate is colder and less changeable, in conseence of the presence of a snow-clad mountain group, and the greater distance from ocean. I found at Taupo the acacias of Van Diemen's Land, the Ricinus palma risti, and potatoes, affected by the frost—a circumstance which never happens near coast—the leaves, also, of several trees had become yellow and deciduous. The ndscape assumed an autumnal tint, although it can scarcely be said ever to have d a wintry appearance. At Wellington, on the contrary, and along the whole st, the natives plant their potatoes at all seasons of the year, the forest remains ergreen, and the opening of the flower-buds is merely a little retarded during the ason of winter, the presence of which is only indicated by more frequent rains and nds.

Owing to the continual interchange which takes place between the heated air of the uator and the cold air of the antarctic regions, an almost continual wind is kept , which blows either from the N. and N.W., or from the S. and S.E. Out of 365 ys, the entire year, there were only twelve which could be called calm days: dur-g 213 it blew from the N. or N.E., and during 119 from the S. or S.E. It is ficult to say which wind is the most violent: the S.E. winds are very strong, but e most severe gales which I experienced were from the N.W. During the winter nths the latter prevail; but, when the sun has a southern declination, southerly nds blow, in consequence of the greater degree to which the air is heated under equator, and the current of cold air which rushes in from the south to replace These winds have a very beneficial effect upon the climate. No sooner is mist fog formed than they dispel it, and thus purify the atmosphere, and prevent the lection of noxious exhalations; they produce also the remarkable feature of the ntinual chasing of clouds and sudden alternations of rain and sunshine, which fol-r each other in far more rapid succession than is ever experienced in England, ich has been so unjustly accused of having the most changeable weather in the rld. In this respect, also, the western coast is less affected than the eastern: a olent gale has been known to blow at Wellington when there was fine weather d only light winds at Nelson. New Zealand possesses a humid and moist cli-ate. If we consider the immense oceanic surface which surrounds it on all sides, d from which a constant evaporation of watery particles proceeds, we shall readily ticipate that the atmosphere must be almost constantly at or near the point of uration, and that, when any change of temperature takes place, the moisture will at once condensed and fall in the form of rain. The wood-covered hills and the est land, which constitute the greater part of New Zealand, attract the humidity, d render rains more frequent than they would, perhaps, be if the land were ared. It rains in New Zealand during all the months of the year; but the eater quantity falls in winter and spring, when there is also the greatest number rainy days. At Port Nicholson, the quantity of rain, from April 1841 to Feb-ary 1842, was 34.49 inches. The quantity of rain which falls annually in London only 23.1 inches, according to the results given by Mr Daniell, while in the brides the amount is nearly twice as large, ranging from 35 to 46 inches. With-pronouncing a decided opinion from a single series of observations, and those en at only one place, and during ten months, I may, I think, safely draw the clusion that New Zealand has a rainy climate, and may be ranked, in this pect, with several places in England.

In the following table we have condensed two of Dr Dieffen-ch's, shewing the quantity of rain and the number of rainy

days in each month, at Port Nicholson, from April 1841 to January 1842:—

	Inches.	Days.
April . . .	1.86	9
May . . .	3.71	11
June . . .	4.12	18
July . . .	3.84	17
August . . .	4.56	14
September . . .	4.51	14
October . . .	2.31	16
November . . .	2.95	14
December . . .	5.47	15
January 1842 . . .	1.16	5

Dews are particularly heavy during the winter months. In the interior, where there exists a long line of lakes, fogs rest upon them in the mornings, and also upon the river courses, particularly those of the Waikatoo and Thames; but they are soon dispelled by the sun, when some degrees above the horizon, or driven away by the winds. The result of a climate so moist is a vigorous vegetation.

Sandy places, which, in any other country, would be quite barren, are covered with herbage in New Zealand; and the hills, which, in lithological and geological formation, resemble those of Devonshire, may, in the course of time, be converted into pastures, at least equalling those on the hilly portions of that county. Everywhere, also, trees and shrubs grow to the margin of the sea, and suffer no harm even from the salt spray. The humidity of New Zealand is not considered to have much injurious effect on animal life. Cattle and horses are in as good condition as can be expected from the present scantiness of grass pastures; should they, however, be found to suffer from the moisture, the cattle can at all times be driven from the valleys to the hills, where the drainage renders the ground sufficiently dry. I much doubt whether as good a report can be given concerning sheep, which always seemed to suffer from wet; and it cannot be denied that this moisture, with all its beneficial influence on the vegetation of the country—which includes the tree ferns, generally confined to the tropics, and a species of palm—will be injurious to those fruits which are claimed as the ornaments, and almost as the symbols, of Southern Europe—to the olive, the vine, and the orange—and that New Zealand does not rank higher, in this respect, than the south of England. The humidity will, also, it is feared, be injurious to the silk-worm. The physical configuration of New Zealand, and the geological formation of the hills, are, in general, such, that the rain is rapidly carried towards the coast in countless streams and rivulets. The lakes, with which the interior of the northern island abound, have always an outlet, and it is only in a very few places that swamps exist, and these are owing to the clayey nature of the subsoil; but they are not sufficiently important to influence the general state of the humidity of the air, or to become insalubrious. In the neighbourhood of Port Nicholson, the rain quickly percolates through the light upper soil, and feeds the numerous streamlets which rapidly carry it off into the sea.

The temperature which, from its latitude, we should expect in New Zealand, is extensively modified by all the circumstances I have mentioned. The first of these is the narrow shape of both islands, which gives a very extensive coast-line, into the numberless harbours and inlets of which the sea enters; and, as it preserves a certain mean and moderate temperature throughout the year, it modifies the climate of land which is surrounded by it; and uniformity of temperature is consequently characteristic of the climate of New Zealand. It is most humid, as well as most equable, on the coasts, where, also, vegetation is fresher than in any other portion of the islands. There is no great heat in summer, no severe cold in the winter. Sometimes, indeed, in the winter nights, the thermometer sinks to the freezing point, and the stagnant waters in the interior are covered with a thin crust of ice;

but, during the day, it is very rarely that the temperature is below 40°. In a moderately convenient house, fire could be dispensed with throughout the year; but the habit of having a fire every evening, summer and winter, might be easily acquired.

The mean temperature of July, the coldest month, was, at Wellington, only 48.7°; the greatest cold during the day was 38°, the greatest warmth 57°. On the other hand, in January, the warmest month, the mean temperature was 66.4°; the highest 76°, and the lowest 57°. The mean temperature of the whole year was, at Wellington, 58.2°, and the mean temperature of the different months was as follows:—

January	66.4°	July	48.7°
February	64.8	August	51.2
March	62.5	September	53 5
April	63.5	October	59.2
May	51.8	November	60.5
June	51.3	December	64.7

It has been already stated that Dr Dieffenbach considers the country, from its humidity, unsuited to the vine, and he draws the same inference from its temperature; for, though 58.2° is a mean temperature sufficiently high to ripen the grape, the mean of the three summer months is too low, a mean summer heat of at least 66.2° being necessary for a wine country. These facts, however, were drawn from observations made at Wellington, where, from its peculiar situation, the temperature is lower than at Nelson and New Plymouth, at the latter of which he often found the thermometer nearly 10° higher in the shade than it ever was at Wellington. But whether suited to the culture of the vine or not, the climate must be regarded as admirably adapted to the culture of turnips and artificial grasses, provided land can be found in the valleys, and on the sides of the hills, sufficiently level, or not too steep, for arable culture to be carried on upon an extensive scale. The country, however, in general, appears more adapted for cultivation by a race of peasant proprietors than by farmers of capital. With respect to the salubrity of the climate, he speaks as follows:—

As the atmosphere, by its moderate warmth, its humidity, and constant current, is peculiarly favourable to the vegetative powers, as we see in the luxuriant growth of plants, so, from the same causes, it suits the human frame. In the families of the missionaries and settlers, I observed no deviation from the original stock. The children grow well and strong, with fresh and rosy faces; and I am satisfied that, in this respect, New Zealand is in no way inferior to Great Britain. A humid and temperate atmosphere acts especially upon production, both as it regards growth of the body and numerical strength of families. Nutrition and reproduction are in good order, in respect to the numerical strength of families. The climate seems to be particularly favourable to the increase of population; at least all the Europeans have large families. We see the effect of this humid climate in certain diseases, to which Europeans first arriving in the country are often subjected. These are abscesses or boils, and eruptive diseases—neither, however, of a malignant character, and both disappearing without medical aid. Among the natives, carbuncles and diseases of the mucous membranes are common. Here, however, other causes are acting, of which I shall speak more hereafter. True, inflammatory diseases are uncommon; the S.E. wind of New Zealand is never so keen as our north-easter; but, in consequence of the moisture of the climate, such diseases always assume the character of catarrh. I am not aware that any endemic diseases exist in New

Zealand. Influenza, however, and sometimes croup, appear epidemically. If care be not taken, rheumatisms also make their appearance; but it is certain that causes which, in England, would produce violent colds, and other injurious results, pass over in New Zealand without any bad effect, even to those colonists who are in delicate health.

The purity of the atmosphere, resulting from the continual wind, imparts to the climate a vigour which gives elasticity to the physical powers and to the mind. Heat never debilitates, not even so much as a hot summer day in England; and, near the coasts especially, there is always a cooling and refreshing breeze. The colonist who occupies himself with agriculture can work all day; and the mechanic will not feel any lassitude whether he works in or out of doors.

From all this I draw the conclusion that, as regards climate, no country is better suited for a colony of the Anglo-Saxon race than New Zealand: and were this the only recommendation, it would still deserve our utmost attention as the future seat of European civilisation and institutions in the southern hemisphere; since in the other southern colonies—for instance, in that of New South Wales—Europeans undergo more or less alteration from the original stock.

Invalids rapidly recover in this climate, and there is no doubt that the presence of numerous thermal waters in the island, and the attractive scenery, will make New Zealand the resort of those who have been debilitated in India, and are in search of health.

From the important consideration of climate we pass to a scarcely less important consideration, the nature of the soil. Argillaceous slate, generally yellow, forms the fundamental rock, associated with flinty slate, and other metamorphic rocks, and pierced by various ancient volcanic rocks, such as basalt, greenstone, trachyte, and other compounds of felspar with hornblende and augite. This is the structure of the districts about Queen Charlotte's Sound and Cook's Straits, where the features of the country are entirely mountainous, and thickly wooded hilly offsets run from the main chain, which extends through the centre of the islands, its highest parts being covered with perpetual snows. These hills come down abruptly to the coast, where they inclose small bays or coves, which are surrounded by steep hills, in the form of an amphitheatre, and rarely contain more than half a square mile in area of flat land. The soil is a light earth, consisting of vegetable mould, more or less mixed with shingle or sand. In these places there are generally some native huts, and the natives find the soil most suited to the cultivation of the kumeca or sweet potato. For their other crops, however, they prefer the sides of the ravines of the hills, where, after having burned the wood, they obtain for cultivation a new and fertile soil, in which the surrounding forest preserves a continual supply of moisture. The slate rock has, in general, undergone very little disintegration, but it is covered with a moderate layer of vegetable mould, which collects to a greater thickness on the sides of water courses and in the gorges of ravines. Generally speaking, however, the vegetable mould is only a thin stratum, and the extreme freshness of the vegetation arises from the constant humidity of the climate. Such is the structure of the hills around Port Nicholson, which inclose a triangular space between

m and the sea, formed of alluvial land, brought down by the r Eritonga or Hutt. This, with a sandy beach, two miles l a-half in length, which bounds this alluvial plain, is the only t land in the neighbourhood. The apex of the Delta is about ren miles from the beach. The hills approach each other and m the gorge of the river. At the distance of about fifty miles e Tararua range of mountains—the central ridge of the island—ns north and south, throwing off branches to the coast. ough the boundary hills, east and west of Port Nicholson, rise ruptly from the waters' edge, yet in the peninsular part, where 'ellington has been founded, there is a strip of flat land at their se, about the third of a mile broad, consisting of sand, shells, ingle, and vegetable earth, and extending to the western head-id of the harbour, where the hills are low and undulating. ich is the situation of Port Nicholson, the first town founded the New Zealand Company, and the commercial capital of w Zealand. Dr Dieffenbach thus describes its progress during e short space :—

Nearly three years have elapsed since our first visit, and in a spot scarcely known ore that time, and rarely, if ever, visited by Europeans, and just beginning to be iated in the forms of Christian worship by a native missionary, there is now a n with warehouses, wharfs, club-houses, horticultural and scientific societies, e-courses, and, in short, all the mechanism of a civilized and mercantile commu-. At this very spot, where I then enjoyed, in all its fulness, the wild aspect of ire, and where the inhabitants, wild and untamed, accorded well with their native iery, there is now the restless European spreading around all the advantages and dvantages of civilisation and trade.

With respect to the agricultural capabilities of the vicinity, he ewhere expresses an opinion that—

lthough the crowd of mountains around Port Nicholson is remarkable, and the l very thickly wooded, steady industry and perseverance will find a sufficient nt of available land to support a town, although connection with a larger agricul-l district will be indispensable.

he natives, he again observes, choose for cultivation the very small extent of flat l found in the little coves and bays which the coast forms in innumerable places, which are less wooded; or they choose still more frequently the bottom of ravines, re they destroy the forest by fire, leaving the unconsumed stems of the trees to y naturally. Here the fertile earth is in greater abundance, and a never-failing of maize, potatoes, turnips, cabbages, sweet potatoes, and pumpkins, recom-ce their labour. In that part of the island, a European population must there-be satisfied to pursue the same system as the natives have done—namely, to erse themselves as small communities over these little bays, and rear the neces-es of life without other labour than their own, and gradually to work their way the ravines, bringing them into such a state as to bear a low herbage of grass and er on which to feed sheep and cattle. The Isle of Mana has thus been converted sheep pasture; but I am certainly of opinion that sheep should be reared chiefly their carcass, as the country is not favourable to the growth of wool. Goats, s, and mules, seem to be more adapted to this part of the country than the rest of domestic animals.

There are, however, in other parts of the northern island, some siderable tracts of tertiary and alluvial formations capable of tivation on a more extensive scale. The district of Taranaki,

in which New Plymouth has been founded, is of the former description: the valley of the Awaroa, yet unsettled, except by a few individual adventurers, is of the latter character.

Taranaki lies to the westward of the Tararua range, in which the Eritonga which discharges itself into the sea at Port Nicholson has its rise. From the part nearly opposite Entry Island to Cape Egmont, and thence to the northward, a belt of undulating land runs along the coast, increasing in breadth towards Mount Egmont, whilst that mountain—a cone of cinders and scoriaceous lava, not to be distinguished from those of the extinct craters of Auvergne, and nearly 9,000 feet high—rises with a very gradual slope from the sea-coast, from which it is distant thirty miles. The tertiary strata, composed of yellowish sandy loam, form cliffs of moderate height, and constitute an excellent substratum for a rich mould which covers the top, and which increases in depth towards the foot of the mountain. This belt of open land is three or four miles in breadth, at which distance from the sea the wood begins, and the soil becomes more substantial and rich. Fern and flax, which usually characterize the vegetation of open districts in New Zealand, are found here, but intermixed with some juicy shrubs and plants, and also some species of grass. Cattle and horses, if allowed a wide range, would find sufficient food; although it cannot be properly called a grazing country. The prevalence of the fern tribe and the deficiency of grass, deprive even the most open parts of New Zealand of that character. This whole district is intersected with numerous streams, the largest of which, the Waiwakaio, is spoken of by Dr Dieffenbach as well adapted to the application of water-power to manufactories and mills, and he does not hesitate to declare that it rivals any in the world for fertility, beauty, and fitness to become the dwellingplace of a civilized European community. It wants, however, a harbour, notwithstanding which, he contends that it must be prosperous, from its agricultural capabilities and facilities of communication by land with Cook's Straits, and along the coast to Mokau and Kawia. Notwithstanding the indications which this district affords of the former activity of volcanic forces, they have been so long extinct, or, more properly speaking, dormant, that no tradition exists among the natives of any eruption, and they maintain that the country at its base is less subject to earthquakes than other parts of the island, particularly those which are most mountainous. At the distance of seventy miles, however, an active volcanic vent, Tongariro by name, rises to the height of full 6,000 feet, and is surrounded by a district of hot sulphureous and saline springs and ponds of boiling mud. The native traditions have preserved no accounts of any extensive eruption of this

n, which was ascended by Mr Bidwell, who found it dis-
; at intervals thick volumes of steam and mud. This
group is probably the centre of the slight earthquakes
ave been felt from time to time at Port Nicholson, at
›n the western coast, at Mata-mata in the valley of the
and at Cloudy Bay in the middle island.

'hole northern extremity of the northern island, called
ıatives Muri-wena, or the Land's End, offers little to
ıropean settlers, consisting, as it does, either of low hills
ps, or drifting sands, occasionally interrupted by bluffs
tic rock. There is, however, land fit for small farms,
ellent soil, sufficient wood, and good facilities for water-
. Most of it is claimed by private purchasers, some of
ill probably occupy their land, and, by their example,
ə the natives to improve their condition. The low
of its hills renders it better suited for sheep pasture
y in New Zealand. The land is worse on the eastern
the western coast, where the shore consists of tertiary
-and-thirty feet high, composed of loam containing beds
ǝ.

lluvial district of the valley of the Awaroa, is a fertile
considerable extent, stretching from the eastern to the
coast, and following the serpentine course of the river,
npties itself some miles to the southward of Houhoura
into the estuary of Banganna, a shallow and extensive
the sea, with an open though an intricate channel for
ə-sized vessels. About twenty-three miles up the river,
uthee has a farming establishment. The banks, which
or three feet above the level of the spring-tides, are
d of alluvial stiff black loam, or of a lighter earth, appa-
ell adapted for grain.

ıer we went, (says Dr Dieffenbach,) the more agreeable was the scene.
ıre were native settlements, with long seines hanging out to dry, and
'es mending canoes and their fishing apparatus—for the season was
ʒ when the shark is caught in great numbers. Here and there, fields of
ımeeras, melons, and pumpkins, neatly fenced and kept extremely clean,
the vigour of vegetation for which New Zealand is so remarkable. Their
comed us as we went along, but did not evince any pressing curiosity.
sun threw a stream of gold over the western horizon, which caused the
to stand out in sharp relief against the sky, and made them appear
a indigo colour. Early in the morning we arrived at Southee's farm ; it
›n both banks of the river, which here forms, by its serpentine course,
ural paddocks. The maize, growing ten or twelve feet high, and the
llow wheat, bowing under the weight of the grain, shewed what the
able of producing. Cattle were grazing about, and the well-stocked
bore testimony to an industry such as is rarely met with among the
ettlers, of all classes, who, for several years, have had almost the whole
partitioned among themselves, as the generality of them have bought
the purpose of speculation rather than cultivation.

ıee has about 300 of the natives around him, in his immediate neigh-

bourhood, who cultivate bits of land interspersed with his own, and who, for cheap wages, work for him in various branches of husbandry, and thus procure for themselves those European commodities for which they have acquired a taste. He gives them articles to the value of £2 for every acre they clear. The mode which he adopts in clearing land is to cut down all brushwood and vegetation in summer, and to burn it when it becomes dry. Immediately after this, he sows the land with turnips, and, when these have been gathered, with potatoes, which require only a little hoeing. The roots and stumps are then sufficiently rotten, and the ground can be easily tilled and prepared for grain.

This valley is estimated to contain, on the whole, 120,000 acres of land fit for cultivation. A large portion has been purchased by a few private individuals; but if the government adhere to their intention of not allowing more than 2,500 acres to any one individual, a large portion of it will revert to the natives, without injuring whom they may acquire a large tract of land in one of the most favoured districts of New Zealand, with a fertile soil, great facilities of water communication, abundance of timber, and other building materials. The natives inhabiting this valley, about 8,000 in number, are the most civilized of all those under the influence of the missionaries. They are a quiet, hard-working people, and have, for a very small payment, cut a road thirty-two miles long through the forest, between Kaitaine and Waimate, in the vicinity of the Bay of Islands: they have also cut roads around their own village. Dr Dieffenbach saw them reap wheat and plough several acres of land; and the missionaries encourage them to exchange their former unwholesome food of decayed maize and potatoes for bread. Several of them possess one or two head of cattle and horses. "Their village has quite an English appearance: a church, with a large steeple of kauri boards, has been constructed almost entirely by the natives; gardens with roses are before the houses; and, at the foot of the hill, wheat alternates with vines, with hops—which thrive extremely well—and with various fruit-trees and vegetables. There are also several patches planted with tobacco." The Waiho or Thames, together with the Piako, another river of considerable size, discharge themselves into a large estuary or gulf on the eastern coast, containing several harbours and numerous islands. To the whole of this gulf, bounded by Point Rodney on the north and Cape Colville on the south, Dr Dieffenbach gives the name of the Gulf of Hauraki, though the natives confine it to the eastern part which receives the Waiho or Thames. The valley of the Thames is about one hundred miles long, and, with the exception of the banks of the river, on which the kahikatea pine grows to great perfection, is occupied by fern, flax, and manuka, and will afford good cultivable land.

Coromandel harbour, thirty-five miles north of the Thames, has been much resorted to by vessels trading for the kauri pine, (*Dammonia Australis*) so much prized for spars, which abound

the hills from Cape Colville to Katikuti, its most southern iit on the eastern coast. This tree grows on craggy ground, vered with a white clay, a soil which, from its sterility, is useless r agricultural purposes when cleared. At some distance, howver, from the entrance of the Thames, the kauri becomes scarce, d flat-topped hills, sloping gradually to the coast, are covered ith a mixed forest, the kauri being confined to a few steep hills d ravines: such land, when cleared, is valuable.

The harbour of Waitematu, at the western extremity of the ulf of Hauraki, is the most important which it contains. It is stant forty-five miles from the mouth of the Thames. The rthern head of the harbour consists of two conical hills, one a rd basaltic rock, the other a black and red vesicular lava. The uthern shore, on which is situated Aukland, the seat of government for New Zealand, is composed of sandstone and sandstone nglomerate, with occasional seams of lignite. The surrounding untry is slightly undulating, forming small bays opening wards the harbour, and partially wooded towards the bottom. veral volcanic cones rise in the immediate neighbourhood of e town, affording hard scoriæ, well suited for building and road terials. Of this settlement Dr Dieffenbach speaks in the folving terms:—

The government town of Aukland, considering the short time it has existed, has le considerable progress. Its population, which amounts to more than 2,000, has n drawn from all parts of the island. A bank has been formed, fine barracks have n built of scoriæ, and, were it not for a general spirit of over-speculation in land, hout any attempt to explore the home resources of the island, there would be ry ground for hoping that the place would gradually and steadily rise into imporce. The thing that chiefly recommends the situation of this place for the central n of the northern island, is its easy communication with the coast, both to the th and to the southward. An inland communication through Kaipara with the y of Islands can be effected in five days, even with the present insufficient means ommunication. With the western coast, and with the interior, over Manukao l the river Waikato, nothing interrupts the water communication but two small tages; and even with Cook's Straits relations can be established either by the r Thames or the Waikato and Waipa, and the river Wangannui.

The coast trade, particularly, is of the greatest importance, as the nature of the intry will cause its colonization at many different points at once; and already a nber of small coasting vessels communicate with Aukland. We must not forget t the Thames and the Piako form an extensive agricultural valley, and that, as ir natural harbour, Waitematu is preferable to Coromandel harbour.

In short, it appears to me that there can be no question but that the place has en very judiciously chosen for the site of a town, as commanding a great extent culturable land in its neighbourhood, great facility of communication with the st and the interior of the northern island, and as being a central point for the st powerful native tribes, separating them in a military point of view, and uniting m for the purposes of civilisation and commerce.

Magnificent expectations have been formed as to the advanges New Zealand offers in its natural productions, capable of rnishing articles of export—such as timber, flax, and whale l. These Dr Dieffenbach considers have been greatly over-ted. As regards timber, he says—

It will be admitted that only large spars for the use of the navy will cover the expense of bringing them to the water side, and shipping them a distance of 14,000 miles. After having visited nearly all the timber districts in the northern island, I became convinced that such large and sound spars are scarce, and that, in New Zealand, the kind of tree fit for exporting never forms a continuous forest as in other countries, and as for shipping other kinds of wood, this is quite out of the question, as the price of sawn timber, in New Zealand itself, was, at the time of my departure, 32s. per 100 feet; and the importation of plank from Europe has met with success. It is a fact very notorious in New Zealand that the shipment of spars, from the inordinate expense of bringing them to the water side, has never been profitable to any one. There is certainly a large quantity of timber of all descriptions in the island which will become of the greatest value in the colony itself, when its resources are a little more developed. Upon the labour of the natives the colonist can at present depend but little; and although he will find them, in other respects sufficiently useful, he has to pay them at the same high rate as European workmen, without being sure that they will always work at his command. The export of flax prepared by the natives has dwindled almost to nothing in the last few years, as, from their increased intercourse with Europeans, they have been enabled, by a slight degree of agricultural labour, to obtain all the commodities which they require; and they are therefore averse to the dressing of the flax, which has moreover always been the work of women, and was only resorted to by the men in time of war, for the purpose of procuring muskets, powder, and ball. It is quite true that this valuable plant covers immense districts in New Zealand, and could be procured in any quantity, if a cheap method of preparing it were known, but till then it cannot be regarded as likely to promote the commercial interests of the colony.

The results of the whale-fishing on the coasts of New Zealand are of very small amount in the British market, owing to the indiscriminate slaughter of the fish during the last fifteen years, without due regard to the preservation of the dams and their young. The shore whalers, in hunting the animal in the season when it visits the shallow water of the coast, to bring forth the young and suckle it in security, have felled the tree to obtain the fruit, and have thus taken the means of destroying a profitable and important trade.

As for the belief that the ships of the several nations engaged in this trade must resort to New Zealand for refitting, as being in the centre of the southern whale-fishery, it is quite erroneous; the fact being, that, as soon as New Zealand became a British colony, the whalers deserted it, and went to Otaheite, or some other of the Polynesian islands, where they could be supplied with wood and provisions at a much cheaper rate.

I would wish to impress these facts upon the reader, for the purpose of showing that there is not, at present, in New Zealand, an article of export which can be depended upon to produce that balance of trade which is necessary for the success of all commercial communities. Exports must be created in the island by means of the agriculturist; and it is the highest praise of the country that they can be created, and that they do not differ from the same articles produced in England. England, in former times, had scarcely more exports than New Zealand has now; but the natural resources and geographical position, which secured to Great Britain its unequalled prosperity, are, though much inferior, yet similar in New Zealand, and may give her, in the course of time, as high a position.

It will readily be concluded, from these observations, that, in New Zealand, by far too much importance has been attached to commerce, and to those natural products just mentioned, and that many incorrect and exaggerated statements as to the present capabilities of the colony have been brought forward. In a country like New Zealand, favoured in so many respects by nature, but which cannot be regarded as an entrepôt, or point of transit, the first question should be—Can the settlement produce all that it may require for internal consumption, and will provisions be cheap, as compared with the price of labour? This should undoubtedly be the case in New Zealand, and, consequently, the supply of provisions to ships and to the Australian colonies will be the principal source of export.

That the real advancement of this promising settlement has been retarded by the extravagant expectations which have been

med as to its capabilities, and by a desperate system of land-bing, which the measures pursued by those in authority ded rather to encourage than repress, there can be no doubt. this subject we had marked some striking passages for raction, had space permitted. Want of space, likewise, coms us to pass over the interesting subject of the natives, of om Dr Dieffenbach speaks in the most favourable terms, with y the incidental notice which the description of Mr Southee's m, on the banks of the Awaroa, affords of their docility and itude for civilisation. A large portion of the second volume levoted to the natives, their origin, language, customs, cha ter, and intellectual faculties, religion, and numerical strength. eir numbers, in both islands, the author does not estimate at re than 115,000. From the chapter on the best mode of islating for them, so as to preserve them from that extermina-n which has hitherto been the fate of other aboriginal races h which European colonization has come in contact, we would dly have made some extracts, abounding with judicious sug-tions and benevolent feeling, well worthy the attention of se to whom the destinies of this interesting race are com-tted; but we must content ourselves with the following pas-ge:—

Not the least important feature in this colony is, that there exists already a nerous and deserving population of natives, who perfectly understand that they e become English citizens, and are aware of their duties and rights as such. It leasing to reflect that the first serious attempt will be made in New Zealand to lize what has been termed a horde of savages, to amalgamate their interests h that of Europeans, and to make them participate in the hereditary immunities l privileges of British subjects. The natives are the national wards of England; l it seems possible to prevent another blot on the page of history regarding the ercourse of civilized nations with savage tribes.

The preceding article was written before intelligence had ached us of the late lamentable occurrence in Cloudy Bay, or, at e risk of rendering it inconveniently long, we should have de-ted more space to that part of Dr Dieffenbach's work which lates to the native population. His opinions respecting them e, as we have stated, highly favourable; but, at the same time, foresaw that the elements of discord were rife between the o races, and, warned of the danger of an explosion, he pointed t, on the one hand, the natives only just emerging from barbar-n, better instructed in the rights than the duties of civilisation, ught covetousness as one of its first lessons, conscious of the lue of their land and their labour, and not disposed to part th either without an equivalent. On the other hand, the set-rs, eager in the pursuit of gain, not over-scrupulous about the eans of obtaining it, and more disposed to despise the natives savages who could have no rights or property than to meet

them on those terms of equality which they expect, and have a right to expect, both as British subjects and t › original proprietors of the soil. Dr Dieffenbach does not hesitate to declare that, in most of the squabbles between the New Zealanders and Europeans, of which the particulars have reached him, the latter were the aggressors. As far as the imperfect evidence yet received goes, it would appear that, if this was not actually the case in the late unhappy affair, there was, at any rate, enough of indiscretion and bad management, as well as of untoward occurrences, to justify the natives in the belief that the first act of aggression proceeded from the civilized man. The affair, however, is in the hands of the government, who, we trust, will act with coolness and impartiality, and will so temper firmness with conciliation as to prevent any permanent interruption of that general good understanding which has hitherto prevailed between the two races, and which is so essential to the welfare of both. If the severe lesson the colonists have received shall teach them caution and moderation, it will not be without some wholesome fruit, and may have the effect of preventing, in future, more sanguinary contests, which must either end in the extermination of the natives or the abandonment of New Zealand as a British colony.

ON THE IMPORTANCE OF AGRICULTURISTS ACQUIRING A KNOWLEDGE OF THE NATURAL SCIENCES, AND A HABIT OF ORIGINAL OBSERVATION.

By James H. Fennell, Author of a "Natural History of Quadrupeds."

Numerous facts on record unite to convince me that agriculturists would find it very advantageous to habituate themselves to making minute examinations of little objects and incidents in nature which occur at every step, but are too often disregarded. It is desirable that agriculturists should not only read books on natural history, but that they should closely observe with their own eyes everything in the fields, orchards, and gardens, that they may glean some useful hints from nature's own volume.

In the cultivation of plants it has been found best to proceed on such scientific principles as a correct knowledge of their structure and functions will suggest. The system of assolements, or the rotation of crops, by which the produce of our land has been quadrupled, and the acclimation of plants by hybridization or engrafting, by which means the fruits and flowers of more southern regions are reconciled to our climate, are only two out of

camples which might be adduced of the benefits conferred ny upon agriculture.

e science dictates such valuable improvements as these, e observation of trifling facts often suggests useful ideas. d that the occasional natural union of the boughs of dis- es demonstrated the practicability of grafting, and that ervation of the circumstance of a vine shooting more ly after a goat had browzed on it, suggested the valuable uning fruit-trees. In the sixty-third volume of the *Philo- Transactions*, we find it related that M. Mustel having l that some of the flower-buds of an apple-tree had been off by a snail, in such a manner that all the petals and had disappeared, being eaten up close to the calyx, ogether with the basis of the pistillum and the embryo, t uninjured, concluded that those imperfect flower-buds ear nothing, but was soon convinced of his mistake. ll of them bore fruit; the apples were perfectly formed, or seven pretty large ones were seen upon each bunch. other hand, the snail had spared some other bunches could not so easily get at; but, out of ten or twelve in each of these bunches, not above one or two exhibited s of fruit. This suggested to M. Mustel the idea that, e flowers of trees are full blown, the prevention of the fall of the petals and stamens gives a greater assurance ructification, a fact which he several times proved; for, ut off with the scissors the petals of apple, pear, plum, ry blossoms, close to the calyx, he found that almost e of them bore fruit, whilst several of the uncut flowers ne. Thus did a snail teach him how to render a tree itful. One of the Emperors of China having noticed articular stalk in his garden produced better rice than , cultivated it for several years; and then, having fully himself and his subjects of its superiority, he distri- s grains among them for their general benefit. A Sus- er having remarked that some gooseberry bushes, grow- r an elder tree, were exempt from the attacks of cater- vas induced to try the efficacy of a decoction of elder destroying the grubs that infested his turnip crops, and other farmers who repeated the experiment found it il.

I may observe that it is not only necessary that the rist should be well acquainted with the nature of the vegetables which he cultivates for economic purposes, he should rightly understand the causes of the several and diseases to which they are subject, so that he may o devise proper remedies and preventions. In this wide

field for observation and practice, natural history will be found a useful guide. In nine cases out of ten the failure of crops, and the pecuniary loss experienced thereby, arise from the attacks of some particular species of destructive insect which, from unknown causes, has appeared in unusually great numbers. Before any effectual steps can be taken against it, it is absolutely necessary to ascertain correctly what species of insect is causing the mischief, and to study the creature's habits in all its transformations; for what will prove more or less effectual in one stage of its existence, will be totally useless, or, perhaps, increase the evil in another. Notwithstanding the immense annual losses which must be caused by the millions of destructive insects that infest all kinds of crops, the science of entomology is comparatively neglected by agriculturists, who are, therefore, frequently unable to give a definite description of any noxious insect to a naturalist when they require his opinion and advice.

Those husbandmen who have possessed some knowledge of natural history have not merely been better able to cultivate their plants and protect them from the attacks of hurtful creatures, but they have ascertained thereby what creatures are harmless and useful, and therefore to be spared and encouraged. Without this power of discrimination they may be unwittingly led into the error of destroying creatures which were absolutely beneficial to them. Lady-birds, which are now well known to be most useful little creatures, feeding only upon the hurtful plant-lice, were at one time as mercilessly destroyed as the plant-lice themselves. We are told by Mr. J. D. Salmon that, in the neighbourhood of Scoulton, in Norfolk, there is a very extensive colony of black-headed gulls, (*Larus ridibundus*,) which are carefully protected and encouraged by the farmers, who have noticed that they render most useful service by following the plough to feast on the cockchafer grubs and other insects that it turns up to the surface. So greatly do the farmers value the assistance of these birds, that they have implored the proprietor of the mere at Stanford Warren to discontinue gathering their eggs. In the first season after their eggs were spared, it was calculated that not less than 15,000 young birds were hatched, and the immense supply of food which this numerous progeny required, greatly increased the exertions of the old birds in obtaining for them many thousands of worms and insects.

Those farmers who, from ignorance, permit poisonous wild plants to spread unchecked, frequently sustain serious losses among their cattle; for though these animals refuse such plants when grown to maturity, yet, in the early spring, when there is a deficiency of herbage, and the noxious sorts betray no sensible odour, they will eat, in their extreme eagerness for green food,

most anything that presents itself. Linnæus mentions the ath of many cattle from feeding, in early spring, upon the ater-hemlock, (*Cicuta virosa ;*)* and, more recently, Mr Edwin ees has recorded the death of several fine cows from eating ie roots of a poisonous umbelliferous plant which had been trelessly suffered to grow about the sides of a ditch.

Natural history, in its most extensive sense, being inseparably onnected with all the arts of life, ought to form a part of the lucation of those who wish to promote them and to benefit by iem. In every school in the kingdom, whether intended for ales or females, for the rich or for the poor, natural history iould find a foremost place as an elegant and useful accomplish- ient. There is hardly a common animal or plant concerning hich some egregious error may not be detected in the minds of ie generality of what are termed well educated people, who ride themselves on possessing a *finished* education—finished, deed, before it had fairly commenced; for they who have learnt iything know that neither man's nor woman's education can rer be complete, as every day of our lives may be made to yield n improvement upon the lessons of our youth. No one will rest ontent with what he knows to-day, unless he wishes to be a unce to-morrow. The wisest men love to call themselves stu- ents and labourers in the mines of knowledge, seeking for new icts and even for new sciences that are yet in concealment, and hich are destined to improve the earthly condition of man, and impress him still more strongly with an incessant conviction f the care which God has taken to provide innumerable blessings r his industrious and grateful people—blessings which he has ut temporarily hidden from us, so that we have the advantages f labour, health, and hope, in seeking for them. All the world ras simply nature when God completed it, and natural history, i its widest meaning, is the history of that world of nature, and, herefore, ignorance of natural history is ignorance of God's rorld, which presents the most sublime and useful study man can ursue.

How general the existence of ignorance is on the subject of atural history may be easily conceived from the absurdities re- ative thereto which may be found in the writings of even the iost popular essayists, novelists, critics, and others who are more iterary than scientific. Latin, Greek, and Heathen mythology iave been too frequently learnt to the entire exclusion of any nowledge of those divine works by which we are surrounded, nd whereby we may practically benefit ourselves and fellow-crea-

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* A similar plant, *Œnanthe crocata*, has lately been discovered by Prof. Christison o be innocuous to man and animals in Scotland, though in the south of England, nd also in France and Spain, it has proved itself an active poison.—EDITOR.

tures. In Sweden, natural history is the study of the schools by which men rise to preferment; and we are assured by the celebrated botanist, Sir J. E. Smith, that there are no men with more acute or better-regulated minds than the Swedes. In the forests of Germany, especially in the small states of the interior, the Hartz, Thuringia, &c., there are schools in which are taught surveying and planting, together with the zoology, botany, and mineralogy of the forest. At one of the most celebrated schools in the world, namely, that of M. De Fellenberg, at Hofwyl in Switzerland, it is the chief aim of the instructor to inculcate in his numerous pupils the importance of closely examining such surrounding objects of nature as will most concern them when pursuing the particular professions and trades for which they are intended. The school contains about 450 scholars, among whom are many peasant boys; and no opportunity is lost of directing the attention of all, but especially of the latter, to nature's works, which are eagerly sought after, attentively studied, and most carefully perused for future reference and instruction. The collecting of these objects affords an employment which is not only amusing and useful, but healthy. The museum thus formed is constantly increasing, both in variety and utility. The plants it contains are not classified scientifically, but according to their properties, uses, and localities. Seeds and specimens of useful sorts of wood enrich this botanical collection. Quadrupeds, birds, reptiles, and insects are also studied and preserved by the pupils. The winter evenings are instructively spent in this room by the poor children with their master; and on Sundays, after church, they go forth to the hills and woods, seeking fresh treasures for their museum. At Carra, in the neighbourhood of Geneva, there is also an agricultural school, where the children are taught the economic botany of their native country, besides a variety of other useful subjects. They amuse themselves with botanical excursions, and the little students carefully bring home and preserve all the plants which they collect.

Hogg, the Ettrick shepherd, declares that those writers speak falsely who assert that our labourers, herdsmen, and peasants in general, have little or no feeling of the beauty of nature; and he might have added that they are frequently close observers of her works. This fact induces me to believe that much benefit would arise by giving a more scientific aim to their habit of observation. How readily the shepherd notices slight external differences, even in objects of the same species, is exhibited in his ready discrimination of any one sheep in a flock, consisting of even many hundreds, though to the casual observer all the sheep seem exactly alike. Without some nice study of nature's minute distinctions, the shepherd could not so easily detect any sheep in a large flock

The aptitude of peasants to receive scientific truths, when their curiosity is properly awakened, might be illustrated by mentioning a glorious list of eminent philosophers who have arisen from the ranks of shepherds, ploughmen, &c. We shall, however, mention but two examples At Bagis-Beost, near the hot springs of the Pyrenees, lives Gaston Sacaze, whose name has been well known for the last twelve years to philosophical travellers in those parts. Without even quitting his native mountain, or neglecting the care of his flock and the cultivation of his fields, he has found sufficient time to acquire a good systematic knowledge of the mineralogy, botany, and entomology of his native district, entirely unassisted by any teacher except his own eyes and a few books. That he might read the works of Linnæus he has taught himself Latin. Besides systematically classifying all the mountain plants, he has drawn and coloured them, so as to form a rich herbal. At his humble home he has also formed a collection of minerals, stones, insects, &c., and when tending his flock he amuses himself with a violin of his own constructing, and songs of his own composing. So much notice have his talents attracted, that his portrait has lately been taken by the celebrated painter, Devéria. This peasant naturalist calls to mind the instance of John Bertram, the famous Pennsylvanian botanist, who was originally an agricultural labourer, but having his intellectual curiosity excited by an attentive contemplation of a violet, and then dreaming about its beauty and structure, immediately set about learning all the Latin that was requisite to read botanical works.

Great Britain abounds in grammar schools for the poor, but where can it shew anything like the forest schools of Switzerland, Sweden, and Germany? Where are the instructors to teach our peasantry those sciences which they would be practically benefited by understanding? We want to see a full consummation of the benevolent wish of Dr Drummond, that a lecture-room, a museum, and a useful library, should be attached to every village, as regularly as its church or chapel; and that a portion of time should be appropriated to teaching natural history, and even natural theology, to the peasantry. Geology and agricultural chemistry should also be made to throw their light upon the labourer's mind, and his children should be taught something about these subjects, as well as grammar and cyphering. Agriculture would more rapidly attain to perfection, if all, without exception, who are concerned in it, were made clearly to understand the processes on which its fullest success depends. The labourer could not fail to become more skilful and more interested in his employment if he were taught to practise it as a science and not merely as a toil.

The culture of plants will become a comparatively easy process when we are better acquainted with their peculiar functions, and

with the chemical elements which they require for their growth and maturation. We must not be content with knowing what are their respective natural localities, climates, and seasons, but must learn what chemical gases each species imbibes from the atmosphere, through its leaves, and what substances from the soil, through its roots. "If a plant be distinguished by its containing a notable proportion of soda, silica, &c., the soil in which it is to be grown must," as a writer in the *Edinburgh Journal* justly observes, "contain these elements, otherwise the attempt will be abortive;" for a plant can no more create soda or silica within itself than it can form water for its support, independent of the soil or atmosphere. From a knowledge of the principles, therefore, a rational theory of agriculture may be formed; and what has hitherto been little better than an expensive and often distressing system of trial and error, becomes a science guided by fixed laws. Agriculture will always have to contend with the fluctuations of season and climate; but it is for human ingenuity to modify their influence, and this can only be effected by rational and scientific procedure. As yet, the science of agriculture is only in its infancy, but the time is not far distant when it will rank with other maturer branches of knowledge—when every soil will be systematically treated for the species of crop to be raised upon it—when manures will be manufactured as we now manufacture soda and sulphuric acid—when plants will be fed and stimulated as we now treat animals—in short, when the farmer will sow and reap with as much security as the distiller produces his spirit. The value of the science of chemistry to the agriculturist may be judged from the fact that, when the great French chemist, Lavoisier, took a quantity of land into his own cultivation, he very soon succeeded in doubling its produce.

If the proprietor of land would explore its mineral productions with a view to speculation in them, he ought previously to obtain some knowledge of geology. To an ignorance of this subject may be traced the lavish expenditure of money in many futile attempts to find coal in situations where the slightest regard to the principles that have been established, and the rules that have been discovered relative to the association of coal with certain stratified rocks, would have saved those individuals from ruin and misery. As a striking example of the serious consequences that have ensued from seeking coal, without acting under the guidance of geological principles, Sir John Herschel relates that an attempt was made, not many years since, to establish a colliery at Bexhill, in Sussex—the appearance of thin seams and sheets of fossil wood and wood coal, with some other indications similar to what occur in the neighbourhood of the great coal beds in the north of England, having led to the sinking of a shaft, and the erection of machinery on a scale of vast expense. Not less than

?800,000 are said to have been expended in this project, which, is almost needless to add, proved completely abortive, as every eologist would at once have declared it must, the whole ssemblage of geological facts being adverse to the existence of regular coal bed in the Hastings strata, while this, on which Bexhill is situated, is separated from the coal measures by a eries of interposed beds, of such enormous thickness as to renler all idea of penetrating through them absurd. The history of nining operations is full of similar cases, where a very moderate acquaintance with the usual order of nature, to say nothing of theoretical views, would have saved many a sanguine adventurer from utter ruin.

In learning the nature of the underlying soils, and the character of the surface soil, which in many instances depends upon the decomposition of the subterraneous strata, geology affords most valuable assistance. From the mere description of the character of any line of country, the geological agriculturist might form a tolerably accurate notion as to what must be the productions, pursuits, wants, and even the general constitutions of the inhabitants; and, if he possessed a knowledge of geological botany and geological entomology, he would also be able to predict what genera of plants and insects were there most plentiful. Geology could point out to him stores of lime and mineral manure in places where they were not generally known to exist. Without an ample supply of water no farming can be prosperously conducted, and here again geology comes to our aid, and suggests the formation of those Artesian wells which have given the precious blessing of water to many previously dry districts, as in France and various parts of England. Observation on the surface of the earth detects the deep reservoirs below. "Search and ye shall find;" for wherever deposits of a light and porous nature occur in hollows and depressions of firmer and older rocks, water will penetrate until it has accumulated into immense subterranean pools, the pressure of the superior strata preventing the fluid from exhibiting itself to the eye, except in slight oozings at the indented parts of the surface. When proper borings are made through the strata, the water is released from its confinement, and rushes up copiously from the valley or hollow. Beneath those spots of ground over which swarms of gnats are continually seen dancing in the air, the existence of wells may be suspected; for these insects disport themselves always where there is the greatest evaporation. It was by a secret knowledge of this fact that the professors of the divining rod detected hidden wells. Slight superficial observation may also detect concealed mineral springs, which may add to the value of an estate. Thus, the discovery of the chalybeate spa at Dorton, in Buckinghamshire, originated from some villager's attention being attracted

to the circumstance that a little stream, which issued from a small orifice, destroyed the plants that came within its course; the few blades of grass that were spared bore a thick incrustation of oxide of iron; and the surface of the ground, which, for a few yards on either side of its channel, assumed a yellow and scorched appearance, was covered with a similar metallic deposit. The peasants called it the *Alum* Well, the taste of that substance being most apparent to them. It was also observed here, as at the Bath waters, that diseased cattle voluntarily and repeatedly repaired to the little stream, and rapidly recovered from their maladies. It was noticed that it afforded great relief to horses suffering from that very obstinate and almost incurable disorder, the mange. Owing to the powerful chalybeate qualities of this water, the manure of the cattle that drink of it will burn to a cinder, and is collected for fuel, in the same way that the Peruvian miners and mountaineers make bright and clear fires of the dung of the llamas and alpacas.

These several facts will, I trust, suffice to shew to every reader the policy of the agriculturist greatly enlarging his present sphere of knowledge, and the frequent advantages that would result from his practising a habit of original observation, with a view of deriving important suggestions from apparently trifling facts.

THE FARMERS' NOTE-BOOK.—No. IV.

Characteristics of 1843. By Mr Towers.*—We offer no apology for continuing this subject, which, it was obvious, could not be brought to its close in the last Number, and especially as the succeeding weather has been of a character so extraordinary as to claim the utmost attention of the meteorologist. In passing, it will be our endeavour to notice correctly the effects produced upon the growing wheat and the fodder, or green crops, remaining in the field.

October, as was stated, was remarkable for the great quantity of rain which fell after the first week, and for those keen yet severe attacks of frost that reduced the beauties of the garden (with us, at least, in the parallel of London) to zero. Within the space of a few hours, many, very many semi-hardy plants, which the gorgeous *summer* of September had maintained in splendour, were rendered objects of deformity: even the hardy chrysanthemums, unless protected under verandas or in pits, had their heads of bloom decomposed; for not only did six or seven degrees, com-

* Concluded from p. 276.

on at once, exert the power of a much lower degree after
lar approaches, but it effectually decomposed the tissue,
g always attended with a copious deposition of hoar-frost,
wed, within a few hours, by close, muggy heat and rain.
hese alternations of frosty rime, if followed within twelve
's by cirro-stratus clouds from S.W., and great increase
armth, generally afford a pretty certain indication of a mild
rainy winter. They had been the feature of October and
ember, 1842, and as the ground became saturated with water,
bers of farmers were either prevented from sowing autumn
at at the usual period, or deferred sowing from a dread of
her spring check. Be this as it may, we know that many
s were not seeded at any period of October, although it was
omary to consider mid-October as wheat season.
ctober closed with wind at north, totally overcast with clouds,
continuous soaking rain. So great had been the reduction of
perature, that the maximum average of all the days may be
ed at 54° Fahr.
ovember opened with a finer promise; and as the rain abated,
fair weather on the first week, a little more wheat was sown,
icularly on turnip-land, after feeding off with sheep.
Iany persons had taken alarm from the effects observed upon
wheat by the frosts of April, and the profuse cold rains dur-
six weeks of May and June; hence we may presume that
ng has, on the whole, been fully a fortnight later this year
i in the autumn of 1842; and herein our farmers of the
dle counties have made an approach to the practice of their
hren in East Kent, where, upon the deep chalk rocks, a crop
om fails either through rain or drought, the chalk absorbing
uperfluous water, and yet always retaining moisture sufficient
aintain verdure, even during the dryest seasons.
here were no frosts in November equal in severity to those of
ber. Between the 11th and 17th days, the barometer rose
'e thirty inches, and there was some sun; but, in general, the
ther was damp, and the atmosphere calm and gloomy. The
age minimum of all the night, $37\frac{2}{10}$°; maximum by day in the
le, $44\frac{6}{10}$°.
ll the crops remained healthy; turnips very much improved;
er, after corn, fair, but unequal, indicating a lack of some
ganic manure, gypsum most likely. It appears as if clover
turnips degenerate in this locality—certainly the former
mes more patchy; and this circumstance, among hundreds
thers, points forcibly to the necessity of chemical analysis.
want evidences—farmers are not instructed in science: edu-
onal colleges, wisely and faithfully conducted, would elicit
hs that now are only suspected to exist, and we are happy to

hear among our agricultural friends that inquiry is afloat. They who formerly closed their ears and laughed at suggestions, now converse freely with others who bend their attention to the preparation of manures and composts; and we are requested to make trial of new compounds prepared near us, and to report results. These things must be considered as a foretaste of what may be expected to take place; for it becomes daily more and more certain that science is making advances, and is appealed to by numbers who, three or four years since, considered it as unavailable to practical husbandry.

In consequence of the growing importance which is justly attached to analysis of vegetable ashes, and the proof thereby attained that gypsum, ammonia, and the alkalis are essential to vegetation, manufactories of *artificial sulphate of lime*, and of manures rich in *azote*, are extending everywhere.

We have just perused the agricultural report at p. 319 of the *Journal of Agriculture*, and thus have acquired a standard of comparison respecting the weather. Thus we perceive that, as in the south, rain fell abundantly in October, and was followed by "early frost," which also "checked the vigorous growth of the turnip plant." But to this remark we now add that, as November was far more mild than the frosty period of October, the turnips have bulbed remarkably well. We had reason to note the extraordinary height of stem and breadth of foliage; but these did not suffer much, and thus the food for sheep remains abundant even at this day, (January 10,) as an inspection has satisfactorily shown; great breadths being almost as verdant as in October, and large heaps of bulbs collected here and there for the use of the folds. With this remark we pass to the review of the extraordinary month of December.

The first circumstance which claims universal attention, as a rare if not unique phenomenon, was the altitude of the barometer. On the 20th of November, the mercury with us rose to 30 in. 8 cts; and from that day to the 30th of December it never receded to 30 in. The lowest depression was on the 1st, (30 in. 2 cts.,) the highest on the 24th, (30 in. 50 cts.,) an altitude which we never but once observed it to attain in this elevated locality. The averages of thirty-three registrations included in the above-named period gives 30 in. 313 parts.

Yet we had little or no fine weather, but clouds, gloom, haze, and fogs, were abundant. The sun shone brightly on the 2d, 6th, 14th, 17th, and 24th days; the prevailing winds were W. by S.; but, in fact, there was no wind—a silent calm, which scarcely was sufficient to move the particles of dense haze, became the subject of anxiety, inasmuch as many severe cases of low fever occurred, and threatened to amount to epidemic.

From the 18th to the 31st inclusive, with one exception, we did not witness a bright or cheering interval. However, a breeze from the S.W. sprang up on the 31st, and introduced a complete change in the character of the weather.

The lowest temperature was on the second morning, when we had 2° of frost, (30° Fah.) The average of all the nights may be stated at 40° 6′; that of the day maximum at a slight fraction below 47°. Among the striking phenomena of the year, we are bound to notice the singular positions of the planets during the entire autumn, and a considerable portion of the last summer. On this subject we would appeal to the experience of every admirer of the heavenly bodies, and ask whether they can retrace a period wherein the three superiors, Mars, Jupiter, and Saturn, have displayed so many magnificent interchanges? On the 1st of December, Mars, after having approached to and passed the planet Saturn, came into conjunction with Jupiter, and that so closely, as almost to have crossed his disc. He has subsequently progressed far to the east, and has lost much of his brilliancy, and Saturn, also, is sunk in the western horizon, but Venus has assumed his place, and advances rapidly in her course towards Jupiter; so that, for months, three brilliant planets have been always visible, the Moon, in her course, passing the whole of them in splendid detail. We profess no faith in modern astro-meteorology, with its frequent and palpable misinterpretings; but, admitting the electric, mutual-disturbing, and attractive powers of each, cannot but refer much of the singular character of the autumn and winter to planetary agency. We adopt the present tense, because these striking associations are about to vanish; but they may be easily retraced by referring to *White's Celestial Atlas and Ephemiris.*

In quitting the meteorology of the past year, it will not be irrelevant to extend the comparison of data by citing a few short extracts of notices which we find in the *Mark-Lane Express.* One, dated December 30, from East-Lothian, says—"The oldest man now living in the county does not, in the whole course of his life, recollect the month of December to have passed away with the same mildness as that which has just terminated. The harvest and 'back-end' have been equally propitious to the farmer; in consequence, out-door labour never was in so far an advanced state at the same period of the year." Again,

From Innerleithen.—"The weather, since the conclusion of the harvest, has been extremely favourable for the various agricultural operations; indeed, it has had no equal during the last twenty-six years. In point of fact, winter in reality has not yet commenced. The whins on the banks of the Tweed are beginning to put forth their blossoms, and the crows have, for some

time past, been sounding the building note of preparation. The wheat and sown grass look uncommonly fresh and vigorous," &c.

So far our northern neighbours may be enabled to certify or reject the statements which are made by our journals of the weather in Scotland. To come nearer home, we collect from a letter that, in Bedfordshire, the month of December was fine beyond precedence.—"Scarcely a shower of rain, no snow, with the barometer standing nearly the whole month at 'set fair.' The last day indicated a change, and this morning we have a falling barometer, with snow, and the atmosphere a good garment colder than of late. Frost seems now at hand. Farming operations have sustained no check during the whole month, and are consequently very forward, except where the farmers are determined to have a rest. The season has hitherto been most favourable for the sheep at turnips, as well as for the stock gnawing up the rough grass; in both instances they have done remarkably well. The storing of turnips has also progressed favourably as could be wished, and the county, as far as concerns cultivation, is generally much improving."

In *Berkshire*, judging from personal inspection and communications, the winter, or the later sowing, or both combined, have been favourable to the young wheat—it is not so gay as at the close of 1842—yet firm and healthy. Some persons talk of loss of plant, and slugs have had their share; yet if we still see five or six plants in close contact, it is quite certain that more remain than can braird or tiller. If economy be a universal duty in every condition of life, the *saving of seed*—consistent with that *liberal scattering* which tends to increase—must be an act of wisdom. Loss of seed by predatory vermin must, to a certain extent, be contemplated; but do we not *squander*? Does not every well conducted experiment of dibble-sowing prove to demonstration that three of five seeds are wasted?

At the close of the year, then, under every disadvantage, and subject to all the errors of routine practice, it is but just to state that the plant on the ground appears—though to the eye less beautiful and rich—much more promising, because far less in danger from any serious check, than in the luxuriant breadths of 1842. We now enter upon the consideration of the state of agriculture at the commencement and during the course of January.

On the 1st day of the new year, after a little rain, we had a hint of frosty weather. *Snow* fell on the 2d, and in such abundance, that it covered the surface, without drifting, to the depth of six inches. Had that stratum remained for a time, it would have proved a defence against a frost of considerable intensity; but the sun had shone forth with power, and at ten P.M. we marked

l° Fahrenheit. Much snow had previously been melted, or had ussed off by atmospheric absorption, and at eight o'clock of the l, our thermometers stood at 9° Fahrenheit, or at 23° of actual ost—an intensity to which the *first* approaches of frost in 1838 -of Murphy celebrity—bore no resemblance. Some broccolis ere entirely destroyed, and other valuable culinary plants, which ere full of juice, in consequence of the past genial weather, were mpletely decomposed. But in the farm lands the damage was othing; even the upper turnip leaves were only touched at the xtremities. We believe that the severity in the neighbourhood the Thames, in East Berks, far surpassed that of other disicts, as the tables quote 14° to 21° Fahrenheit. Be this as it ay, the mercury rose quickly to 35°, and both frost and snow ussed away in a few hours.

From the 3d to the 7th the weather was very mild; but on e 8th the barometer again rose to 30 inches, with one exption, (night of 12th,) the mercury remained very high till the)th, the wind blowing from some point to the north, chiefly; it there were only two frosts, and those of short duration, passg away before noon. Never was there a finer, more open, and oring-like season than that which we now enjoy; for, even while e wind blows freshly from the north, the minimum by night is 5°, and the maximum in the shade, at mid-day, 44°.

While reviewing the meteorology of the winter, it will not be relevant to take a cursory notice of a theory which is now cirilating through the newspapers. In the periodical from which was copied, the phraseology is somewhat singular, but is renered intelligible by presuming the reader to have an almanac f the present and last year for reference. The party states that e told it to a friend at St Neott's, some forty years back, who as also observed for himself ever since, and equally found it ivariably true. The following is the substance of the prognosic:—"When there is a *new* or *full* moon between the 19th and 4th of March, the preceding *winter* will be mild, and generally indy; the following *summer* wet and cold. If it happen in eptember, the preceding *summer* will be wet and cold, and the ollowing winter mild. I have observed this circumstance for fty years, and never found it vary. You will observe, by the lmanac of 1843, that we had a new moon on the 23d September, nd the previous summer, *i. e.* the last, was very wet and cold; is winter has been, hitherto, very mild; and every appearance present indicates the correctness of the prediction."

The word "*preceding*" darkens and confuses the whole theory, nd indeed is needless, since the author refers the *existing* mild eather to the new moon of September 1843! Be it observed

that the dates 19th to 24th include the periods wherein the *vernal* and *autumnal equinox* may be presumed to furnish their indications, if indeed we admit that they indicate anything. However this may be, we select the following data from the almanacs of the years between 1837 to 1844 inclusive:—

1837.—Full moon, March 22.—The sun entered Aries, (♈.) On the 20th the frost was severe. On the 20th and 22d there were 8° of actual frost. April was cold, bright, sunny; the summer of a doubtful character in the south.

September.—Full and new moons were before and after the assigned period.

1838.—*March* in the same predicament, but the moon was new on 25th. The extreme severity of the preceding winter tried the wheat; but May proved extremely hot, dry, and sunny. Wheat was first seen in ear on the 15th or 16th of June: a little was carried August 16.

September.—New moon 18th day.

1839.—New and full moon *March* 15 and 30. The summer wet and ungenial, with violent thunder-storms.

September.—Full moon 23d. Winter proved rainy, with much flood.

1840.—Full moon 18th, (another exception.) Equinox on the 20th—wind north—weather fine—wheat-cutting commenced in parts of Buckinghamshire July 17—harvest propitious.

September 25.—New moon (an exception) very seasonable—early winter.

1841.—Extremely keen in January, with frequent falls of snow—25° of frost on the 9th.

March.—*New moon* 23d—a failure in a retrospective view, as the winter has been mild and dry, but prospectively correct, the summer being cold, wet, and extremely perplexing. On the 13th of August the land continued soaked with water.

September.—Moons on 15th and 30th, (exceptions.) The early winter abounded with floods; but these were renewed by a recurrence of profuse rain in March.

The lunations of that month were, new, 12th, full, 26th, and, as every one recollects, the harvest was perfect and early.

September.—Full moon, 19th. The winter proved very mild in temperature.

1843.—*March* 16, full moon, (an exception.) The preceding winter was pre-eminently beautiful, the crops also were superb. We have so often alluded to the circumstances which produced subsequent injury, that it would be waste of time to say more upon the subject; but, according to the prognostic under consideration, the new moon of September 23 ought to have been pre-

eded by a wet summer, which, certainly, was not the case; for hough May and part of June were unseasonably rainy, the ummer was sufficiently fine to permit the harvest to be housed n beautiful condition.

It is unfortunate for prognostics that they do not hold alike or all places. It is well known that the weather may be per-ectly fine for weeks in the south of these islands, while it is ound wet, and in every way ungenial, in the north, during the ery same period. *Meteorological Tables* are useful as records, nasmuch as they instruct by comparison of dates: they tell of what has been, but say little concerning the future.

This winter has been mild indeed, and January has passed away with but one rigorous visitation. At its close, the prevailng calm state of the atmosphere has been exchanged for brisk currents of wind from west by north, and a few showers. The wheat is beautiful, strong, and regular, but not luxuriant—a state which, with the spaces (not crowded) between plant and plant, offer a fair and encouraging promise of security, and abundant tillering in the spring.

The average temperature by day, as a maximum, has been 43°; by night, minimum, 34½°, as a very close approximation. The day of the 31st has closed the month with very strong, gusty wind, and repeated scuds of snow. Temperature at 10 P.M., 32°.

*On the Disease in the Potato Crop.**—In the periodical works of agricultural literature, the attention of the reader has been particularly directed of late to the subject of the dry-rot in potatoes. The great loss of produce in harvest, occasioned by this disease, makes it necessary for the future that greater care should be taken in the management of this vegetable, now of such great importance on account of our rapidly increasing population.

Naturalists, who have been called upon for advice upon this subject, seem to differ as to the cause of the disease. Some of them affirm it to be a species of fly, others attribute it to small fungi, or parasitical plants, which occasion the scab and corruption of the potato.

Dr Sprengel tries to prove that the protoxide of iron present in the soil, being rendered soluble by the ammonia of the manures, (particularly of sheep's dung,) exercises a great influence upon the putrefaction of the potato. Setting out with this theory, he considers the different effects of marls, in the cultivation of the potato plant, to be dependent on the greater or less proportion

* From the *Livlundische Jahrbucher*, an agricultural periodical, published at Dorpat and Moscow. Translated by Mr Flensburg, Second Assistant in the Laboratory of the Agricultural Chemistry Association.

of protoxide of iron which they contain. He thinks it probable that the bad effects of the marls which contain protoxide of iron upon the potato may be prevented by exposing them for a considerable period to the action of the air, by which means the protoxide is converted into the peroxide of iron.

Many also believe that the constant cultivation of the potato from the root has weakened the vital energies of the plant, and try to account for the disease, and the consequent failure of the potato crop, in this way.

In the 2d part of vol. iv. of *Der Allgemeinen Landwirthschaftlichen Monathschrift*, published by Dr Sprengel, is given an outline, shewn in the following valuable remarks and suggestions, proposed by the celebrated M. Standinger of Gros Flotbeck, near Hamburg.

The cultivation of the potato is one of the principal objects of farming in the vicinity of Hamburg, owing to their use for particular economical purposes, the growing of corn being only a secondary consideration. This is particularly the case in Flotbeck, where the cultivation of the potato has been practised on the large scale, ever since its introduction by the late baron Von Voght, in 1786. Though M. Standinger has resided there ever since 1793, and has been engaged partly as a land steward, and partly as tenant, and has been constantly mingling with practical men, there can be no doubt but that he has had great opportunity of acquiring experience in all relating to the potato culture. In all this long course of practice, however, he has never witnessed anything like the disease described by the author of the paper in the previously mentioned part of *Der Allgemeinen Landwirthschaftlichen Monathschrift*. It certainly has happened several times in Flotbeck, that, when the potatoes in wet weather have been laid too close, and mixed with too much earth, they have become infected with disease in the interior of the bulb, and have putrefied; and even when the potatoes which had not suffered from this putrefactive process were planted out, not half of them germinated, and those which did shoot had but a sickly growth, and gave a poor crop. This, however, was not caused by disease, but arose from too much heat in the potato heaps or pits, which occasioned fermentation in the potato, just as is the case when corn lies too thick, and heats.

From the marks given by the author of the paper alluded to, viz. that blue spots can be plainly distinguished when the potatoes are cut through, it is evident that a stagnation of vital action has taken place in the interior of the potatoes, which increases when they are kept, and which eventually is the cause of the sickly growth of the young plant. From these facts it is plain hat [illegible] opinion of the author, the newly planted potato has

ithin itself, the seeds of the dry-rot. The natural conclusion om all this is, that such potatoes should neither be cultivated r seed nor planting out. But as whole districts are occasionally ifested with this disease, it is difficult, and sometimes impossible, obtain perfectly sound potatoes for planting. For this reason e author, in the *Hamburg Correspondenten*, recommends the ising of potatoes from the seed-apples by a simple method, by iich, even in the first year, large and useful potatoes may be tained. The author in the *Allgemeinen Landwirthschaftlichen onathschrift*, seems, however, to doubt this mode of raising m the seed-apples; and, in confirmation of his opinion, ers to an experiment by which he found that potatoes which re raised from seed three years before had suffered from the ne disease. As many may now be afraid to cultivate the ato from the seed-apples as a means of preventing disease, the hor believes he has not begun a useless work when he under- es a more minute examination of the previously mentioned *line of the disease of potatoes.*

The author of the *Outline* just mentioned, supposes this disease arise from two causes:—

He considers the principal reason to be a small fly, very much embling the insect called the vinegar fly, and which the brated philosopher *Ehrenberg* has declared to be a species *ciara*. Further, he thinks that the disease is decidedly infec- is, because ten different kinds of potatoes, which he had pro- ed from Berlin, and planted in a field in which Gibraltar toes, which had suffered from the disease, had been previ- y grown, all of them, with the exception of the Dutch sugar to, became infected; from which he concludes that the dis- d Gibraltar potatoes had infected those from Berlin, which, author presumed, were previously in a sound state.

Vith respect to the hypothesis that the before-mentioned flies the cause of the disease, and the necessity that there exists heir extirpation, he writes as follows:—

He found that, five weeks after he had harvested a crop from ld planted with diseased potatoes, they began to undergo a corruption, and that, even if externally they had a sound arance, they had internally a number of the blue spots, called nation spots, which, when the potatoes were boiled, remained ,* were rejected by cattle, and which could not be used for manufacturing of brandy; as, besides being unsuited for the ose, the potatoes would not go through the crushing-mill. iese potatoes he noticed white maggots with black heads.

* This, the reader will remark, is precisely the character of the disease among ves.

He now included some of these potatoes in a large perfectly-closed glass vessel, and saw, to his astonishment, that after four or five days, maggots and flies could be distinctly detected inside the vessel. The latter were of the size of the vinegar fly, had a greenish colour, and long wings.

"The glass was cleaned and again filled with potatoes. After two days two flies were seen; and, after ten days, ten flies were counted. From this experiment it would appear that the maggots before alluded to are the cause of the failure of the potato crop." Farther on he observes, "Many such potatoes, after planting, were then carefully lifted with a spade, and in the mouldered (*mother-potato*) were found a great number of maggots, worms, small spiders, and beetles. The question now occurs, are these beetles and worms the cause of the putrefaction of the potato, or generated by the putrefaction?"

"As I have always observed in potatoes which are sound when cut, but which have been cultivated in the neighbourhood of diseased ones, a great number of the previously-mentioned flies in the harvest and spring, which is not the case with fresh potatoes; and, as I found, in the spring, maggots in the cavities of the potatoes, I am of opinion that the flies are the cause of the disease in potatoes."

Finally, the author grounds his hypothesis on the following observations:—He says, "Three partially rotten Gibraltar potatoes were planted in a garden, surrounded by sound ones. All three at first went on miserably; but owing to the richness of the soil in the garden, this unhealthy appearance vanished in a short time, insomuch that they gave a luxuriant crop, and, in that respect, were not to be distinguished from the others. Some days afterwards, however, I found a number of gray potato-flies hovering round the Gibraltar potato in the sunshine, but which were not to be found on the other potato stalks. As the large luxuriant bulbs had swelled up the earth round about the roots, and thus occasioned cracks in the soil, it was obvious that the flies had been derived from thence."

These are the author's arguments upon which he founds the supposition that the flies before mentioned are the cause of the disease.

Let us now, for a moment, consider the author's observations. He plants thin, sickly, Gibraltar potatoes, surrounded by others, perfectly sound. These at first came up somewhat unhealthy, but afterwards grew very luxuriantly. Cracks were observed in the soil about the roots of the stalks. All this seems, therefore, to shew that from diseased potatoes were obtained large and sound ones, which sent out vigorous shoots. The author finds a great number of the previously-mentioned gray

,to-flies hovering round the Gibraltar potatoes, and draws conclusion that they are derived from the loosened soil.

'rom his observations it is evident that the sickly shoots from partially rotten Gibraltar potatoes produced three large and ıriant potato plants with excellent bulbs, and still he tries to 'e that the flies are the cause of a disease which did not exist. Ve should conclude, from his experiments with the different ies of potatoes obtained from Berlin, that the disease was occasioned by the Gibraltar potatoes, but that it had its in in the soil. The author does not make the slightest men- whether the potatoes surrounding the Gibraltar potatoes, ,h gave such a luxuriant crop, were at all infected by their ıity. The fact of maggots and flies being found, when pota- having woody stagnation spots were included in a glass el, by no means proves the author's theory, but rather the rary, as the origin of the disease was already in the potatoes, the maggots and flies were merely consequent on the disease, they were obviously not the cause of the stagnation spots, of the incapacity of the potatoes to germinate, which was rly consequent on the spots—and below the stalks of the t were afterwards found maggots, worms, and small ers. The author should have been content with the correct othesis that these beetles, worms, &c., were occasioned by the efaction of the potato, and should have dispensed with the ıtural supposition that these insects are the cause of the uption of the potato. The instance of the fly called the ing fly, or Hessian fly, which, in some provinces of North erica, is said to be productive of so much mischief to the ıt, and to which the author refers, is by no means a well- :ted example, and proves more against than for the German ors, who have themselves visited America, and witnessed damage which the natives affirm is caused by this fly, but h is in reality occasioned by an exudation of a sweet liquid d *honey-dew*, which spreads over the plant as if it were red with gum, and prevents its perfect growth. The flies insects, however, being very fond of this sweet liquid, collect he straw.*

he author also contradicts himself when he says "that the ation of the blue spots must be due to some external influ- or to some chemical agency. This seems to be absolutely ssary, because the potatoes are converted into this blue sub- ce, and thus become assimilated so as to afford nourishment

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he great Linnæus was also in error in supposing that the ergot, *secale cornutum*, roduced by the bite of an insect, because he always found the insects where- the corn was suffering from this disease, whereas, in reality, the flies, being f the sweet drops exuding from the plants, are always to be found upon them.

to the insects ; for it is probable that they could not live up potato in its fresh state." As the author says that he has n concluded his experiments, but intends to prolong his observ nature will in all likelihood soon put him upon the right The means of preventing this disease, which the author gi all either palliations, or proceed from the absurd hypothe the flies, so frequently mentioned, infect the fresh potato that these again infect others. The only specific means of p ing the disease would be to try and procure potatoes from a where the disease did not exist; but, as large quantities w required from such a distant country, this remedy would expensive, and sometimes impracticable, and thus the cul of potatoes from the seed-apples is the only radical cure disease ; but this method has other advantages which wil hereafter. As this plan has hitherto been considered troublesome and tedious one, I shall try to explain how is. I shall take the liberty of making use of a paper published in "*Den Hamburgher Correspondenten*," as my te as it is probable that few of my readers have had the opp of consulting the work. Hence I entertain, then, the view, that the disease had its origin in the degeneratio potato. It has long been observed, as well in the anim vegetable kingdom, that degeneration is transmitted b duals as well to race as to seed, insomuch that, among ve healthy seed occasions a marked increase in the quantit duce. When the same species of potato is cultivated fo ber of years on the same kind of soil, the crop obtained diminishes. When these circumstances are varied i manner that the potatoes obtained from a clay soil a planted on a sandy soil, and so *vice versa* from this ag soil only mixed with clay, then, the circumstances of tem being the same, no diminution is to be observed in t When, therefore, a tenant has the misfortune to raise s toes as, when all possible care has been taken in gather (namely, that they have not been dug up in wet weathe with moist particles of earth, or laid in deep pits in t layers over one another) undergo the dry rot, it is nat such potatoes are not to be used for planting, but that o to be tried which are not infected with this disease. Bu disease may extend over so large a district that it may cult or impossible to obtain sound potatoes for plant necessary to resort to other means—namely, to the culti the potato from the seed-apples, and, in doing so, it is n to pay attention to the following directions :—

In the autumn, when the potatoes are taken in, which is r rally done before the stalks are withered, there may be

quantity of the seed-apples, which are to be preserved in through the winter, under such circumstances that the inous matter which is contained in the fresh apples surg the seeds may be completely frozen, which has the effect ing the seeds to be washed out and separated with greater in the spring. This work is to be done in January, and ll seeds are in February, if the weather permits, or, if not, h, to be sown in a large garden bed, as thinly as possible, from ten to twelve inches apart. These rows can be ınder a hothouse window, and, in that case, the operation performed in January. During frosty nights, however, must be covered with straw. When the small potato egin to be visible, they appear with two small sprouting he third leaf already looks like the rough potato leaf. vs in the garden bed must be kept clear, as the young lants grow much more rapidly in the light.

and on which these young plants are to be planted out previously well manured, and, if in a garden, well turned h a spade, or, in the case of a large quantity of seedeing taken, and there being consequently a great number potatoes to be planted out, a large piece of ground is to ted, free from weeds, and which, if possible, is to be a ate old lea, which, after it has been well manured, must be d as deep as the vegetable mould renders it prudent to go. the greater part of the potato plants have grown to the f from four to five inches, they are to be hoed by means d hoe, and the soil so loosened about them that their nts can be drawn out with a slight pull of the hand. same plant will then be observed two distinct kinds of amely, the usual fibrous nourishing root, and other short ewhat thicker white roots or twigs, which have a broad shaped extremity, upon which small potatoes are already en. The larger plants are to be carefully gathered out e smaller ones, and laid in a hand basket along with os of earth which adhere to them. The small plants are essed down into the soil with the hand, to allow them to ger, and, when they have obtained a sufficient height, to be planted out in the way above described. In the or piece of ground, lines are now to be marked out, first e length of the field, and then across the breadth, two and et apart, the soil being, of course, previously well disin- by ploughing and harrowing. In the exact point where es cross one another, holes are to be made with a *dibble*, ust make so large an opening that there shall be plenty to introduce the potato plant. The earth is then pressed

round the plants with the hands. If it should happen that some of the plants are too small, two of them may be put into the same hole.

The most suitable time for transplanting the young plants is, with regard to weather as well as to the growth of the plants, from the beginning of April to the middle of May. As soon as the first weeds are seen, they must be extirpated with the hand-hoe, particularly round the roots of the young plants. When the plants begin to grow larger and shew leaves, the spaces between the plants are to be ploughed up with the simple potato plough, which cuts through the roots of the weeds in such a way as not to cause the soil to rise up. In doing this the horse must be led by a boy, else many of the plants would be destroyed by its feet. If the weather is moderately fine, the plants grow healthy, and enlarge both in leaves, twigs, and stems, just as rapidly as those plants which are cultivated from the bulbs, and which latter lie in the soil three or four weeks before their leaves are visible above the surface of the soil, so that the potatoes raised from the seed-apples can be gathered with the plough just as soon as those which are cultivated from the bulbs.

At the period when the seed-potatoes begin to flower, the attention of the farmer is particularly requisite, inasmuch as many varieties of flowers are to be observed, arising from the apple from which the seeds are collected. The author has cultivated potatoes from the seed six-and-thirty years, and has obtained potato plants which have produced, white, flesh-coloured, light and dark blue flowers. Each variety of flowers had also a particular form of leaf as well as certain particularities, both in the bulb and in their taste; the potato plants, however, always gave a greater number of flowers, resembling those of the plant from which the seed was taken, and sometimes only a few varieties could be observed.

For example, the apples taken from a large cattle potato, with strong stems and large coarse-grained leaves, and the potatoes raised from them, shewed the same general analogy in their appearance. Those who wish to cultivate potatoes with advantage from the seed, so that they can be used the first year, must not neglect to put sticks to every separate variety of plant, with a mark of the kind of flower, so that in harvest those potatoes which had different flowers may not be mixed together. When the time arrives for gathering them, all those having the same kind of flower must be carefully separated from the others, and preserved, so that the farmer is thus able to choose those which he finds to please him best, both as to taste and appearance, and with regard also to the purposes for which he means to cultivate

iem, and which may be either for the manufacturing of brandy r for use as food both for cattle and for the table.

Upon harvesting the seed-potatoes, one observes, with astonishment, that the stalks are just as large as those grown from the ulbs; but the experimenter will probably be still more astoished, particularly if he has never before tried this mode of culivating potatoes, to find that below the stalks are to be seen a reat number of large potatoes, as perhaps he has formerly ntertained the very general opinion that potatoes raised from eed never attain, in the first year, a larger size than that of from a pea to a nut.*

But, at the same time, it must not be forgotten that below the stalks of the potatoes raised from seed are frequently to be found a great number of *small* potatoes, which is dependent upon the variety of seed from which the potatoes are raised; for example, when the seed-apples are taken from a variety called the Dutch table potato, there is always to be found a larger number of these small ones than is the case when the seed is taken from the large cattle potato with white or red skins.

When the plants raised from seed are grown in a warm place, so that they are sufficiently large to be transplanted in April, provided no night frosts occur, which are always very hurtful to young plants, and the ground is kept loose and free from weeds, these plants give just as large a crop as would be obtained by planting the bulbs from which the seed was taken.

This mode of cultivating the potato from seed has been known from sixty to seventy years, but it has been very little adopted, which is owing to those who have made the trial sowing the seeds too thick, and thus leaving the plants too little room to grow. Under these circumstances, the potatoes could not well be larger than peas or nuts, and in consequence of these imperfect trials, the opinion has very naturally obtained, that it requires from three to four years before the potatoes raised from seed can attain any considerable size.

Even so long ago as the year 1804, the author published an outline of the mode of raising potato plants from seed, as well as of the mode of transplanting. But this outline has either been unknown to agriculturists, or has been overlooked by them. When this method has once been introduced, even though only partially, into practical agriculture, it is probable that the value of the potato for the use of man will be estimated more highly than it has ever previously been. We are yet ignorant what new varieties may be obtained by this mode of culture, with re-

* Most gardeners in this country know very well how to obtain large potatoes from the seed in a single season.

gard to *nutrition*, *mealiness*, and *fine flavour*, and hich may yet be obtained far superior to anything hitherto known to us; because all the kinds hitherto known to practical farmers have degenerated very much from the seed or stock from which they were at first raised. The cases are similar with the varieties of the potato and with our fruit-trees. A bud or twig of an improved tree, when it is grafted on another, brings forth the fruit of both varieties of trees, but when the seed is employed, only one variety is obtained; and so it is with the potato. During the experience of more than forty years the author has never seen it otherwise than that the bulbs, when planted out, always produce the same varieties, both of flowers and bulbs. It never happens that a bulb having a white skin produces a bulb having a red one.

The bulbs can, of course, be larger or smaller, but they always retain the character of the original variety, as well with regard to the flowers as the bulbs. The latter are not the fruit of the plant, but merely scions from it, in the form of bulbs, exactly like the bulb of an improved fruit-tree. The different varieties of the potato may be produced just in the same way as the varieties of fruit-trees are generated, by the kernels or stones. It, however, sometimes happens, when potatoes are cultivated in a garden, or even in a field, and are planted year after year on the same spot, that from the seed-apples spring up a number of small plants, at the time that the land is next year planted with potatoes. If it happens that one or more of these potato plants grow upon the spot where a bulb is planted, they both grow up together, and their plant produces greater or smaller bulbs, which, under these circumstances, may very easily be overlooked. When the farmer frequently cannot perceive this, it is not to be expected that a common labourer can do so. When potatoes grown under such circumstances are again planted out in the following year, differences are to be observed in the crop obtained, and one is apt to believe that this is owing to a degeneration of the bulb. The author has very frequently observed that, when he has sown barley or oats on a piece of land upon which potatoes had grown the year before, and had borne seed-apples, (all varities do not yield seed-apples,) between the barley or oats were a number of small potato plants, which were not generated from the bulbs left the year before, but were produced from the seed of the seed-apples. He has often taken up these plants and transplanted them, by which means he obtained new varieties.

To recur again to the outline of the potato disease, mentioned in the commencement, in which the author considers the disease [illegible] caused by the seed potatoes being too seldom changed,

ough which is occasioned a weakness in the vital energy of the ole organism of the plant. As a proof of the truth of this cumstance, the following may suffice, that in the neighbour- d of Hamburg, as well as also in Holstein, there is not the ghtest trace of this disease to be seen, and no complaint of it s ever been heard, the reason of this being that, in the vicinity Hamburg, there is always an opportunity of obtaining good d potatoes, inasmuch as a great number of vessels arrive with tatoes from Holland, East Friesland, and the Marsch districts Hamburg. From these vessels the farmers in the neighbour- od bring their seed potatoes; because experience has proved at these potatoes, when cultivated, generally give a better crop an those grown upon their own land.* The potatoes grown om the seed-apples seem also to have a more vigorous growth an those which are obtained from bulbs that have been used seed for many years. In those countries, therefore, where is disease exists, and where there are no opportunities of taining easily a change of seed potatoes from those places ere the disease does not exist, the mode of cultivating pota- es from the seed-apples above described, is the quickest and e surest method of eradicating the disease.

Draining Sheep Pastures. By Mr William Hogg, Stobohope, eebles.

"All nature is but art unknown to thee;
All chance, direction which thou canst not see."—Pope.

the absence of human population and human labour, nature, rough all her departments, never intermits carrying forward me principal design, ultimately for the benefit of the human ce. In the fathomless recesses of the ocean, in the deep solitudes the forest, or over the naked surface of the mountains, she is ceasingly making alterations for the accomplishment of her rposes. The agents she employs are, in some cases, feeble; e various movements she bends to her service seem rather verse to than adapted to further her original design; yet when e operation is completed, all seeming inconsistencies have been en "to work together for good." Long before the inhabitants Scotland could understand her operations, nature was pre- ring the mountainous tracts for the reception and support of a ecies of animals necessary for the comfort and accommodation human life; and these tracts, by their alpine situation, could adapted to no other purpose, for the comfort and embellish- nt of life, than grazing flocks of sheep. The hilly districts of

* If there be really no disease in the Hamburg potatoes, might not some of them easily brought to this country for seed?

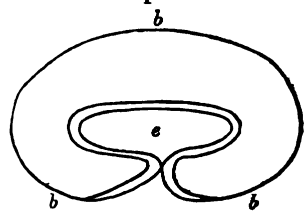
Scotland run out in all directions from an elevated and central headland; the inferior ranges, as they branch away gradually, lower their summits till they sink into the open and champaign country. Between these ridges often sweeps a turbulent and muddy stream, fed by innumerable springs which "rise among the hills." Many of them draw their contents from the interior of the hills. When they emerge into open day are not an inch in depth, scarcely of the same breadth; before running many yards aquatic grasses choke up the puny rill; they spread their waters on every side; and thus form a marsh or bog. These small rills have, for many hundreds of years, been incessantly carrying sand and sediment from the bowels of the hills, and imperceptibly spreading them over tracts below their level. Along with these subterranean contributions, every day of heavy rain—and there are not a few of these among our hilly districts—washes from the shoulders and summits of these ridges thousands of tons of moss. When this profusion of wet and peaty sediment reaches a more consistent surface—which generally intervenes between the broken moss and flat ground which sweeps round the bases of hills—in its progress it collects the stems and seeds of alpine grasses, carrying them gradually down the hill till they reach the lower border of the acclivity—here this mass of ingredients rests on the flattened surface. The sides and bottoms of the glens, thus enriched with the spoil of ages, send up an overwhelming crop of the *Junci* tribe: these, with a deep damp covering of moss, or as it is commonly called fog, are the only or chief productions which such a soil can yield. As this last covers the surface to a considerable depth, it effectually excludes all genial influences; and the constant accession of water, and materials which water brings, silently and imperceptibly deepen and extend the bog. As these productions are entirely rejected by sheep, they fall down, and are decomposed on the spot where they grew, and their remains add a new layer every year to the cold unfertile mould. Here, then, we have an adventitious stratum, of various depth and consistency, generated over the primitive mould; but, to make its produce mild and salubrious to domestic animals, it needs a little help from human ingenuity. Indeed the powerful and irresistible changes which are constantly going forward on the crust of the globe are the works of higher powers than what belong to humanity, and can be little controlled by man; but human activity, assisting the great laws of organic nature, is competent to produce very distinct effects in the vegetable kingdom. Thus far had nature proceeded through an immense lapse of ages, and made preparation over the highest mountains for exuberant crops of grass; but the human intellect did not readily discover the materials she had silently and gradually stored up in this vege-

table stratum. At last an obscure, unassuming character, ventured to unfold the riches that nature had in reserve; and I believe he began the experiment under the scorn and derision of neighbouring storemasters. The experiment was tried on a sheep-farm of the Buccleuch estate, district of Eskdalemuir, a place remarkable for drained sheep land to this day. It is long since the inventor went "to that country from which no traveller returns;" but he lived to see the improvement adopted by, I think, all his neighbours. I was young, he was an old man, when I knew him; I am now old in my turn. The system has now been adopted both on a more condensed and far more extensive scale; and the stocks of sheep, as might have been expected, are proportionally improved both in quality and figure along with the herbage. But, to return: The bog ground which needs draining lies generally in easy slopes round the bases of longitudinal ridges on extensive farms; some of these slopes will run two or three miles, with little interruption; their breadth will not exceed half a mile—in many places not that; and before intersecting it with drains, the whole of this extent was an uninterrupted coarse waste, producing little else than a thin, cold, fibry sprit, altogether unsuited to sheep. In winter, when the shepherd wandered over it, in many places the water swelled over his feet; and was there not much need of draining? If the drain is judiciously planned and properly cut, the water is not long in dropping out at the surface; but between this adventitious stratum and primitive mould there generally runs a line of separation. The drainer gives no attention to this: he only takes out what his spade raises at a single gripe; but if it reach not this looseness in the soil much water will still escape along it; if completely dry below the drain, the soil sinks together upon itself, (for the water kept it in many places buoyant.) Along with the water the spirit of the bog is withdrawn, and, according to the unalterable regulations of nature, both root and stem of the former produce enter upon a state of putrefaction, the large creeping roots of *Juncus squarrosus* let go their juices, and the vital sap of every kind of the former herbage now melts into the soil; but it is chiefly the decay of roots below ground which is of most benefit to the soil. Though the surface is clothed with a dense covering of fog, this is only the excrescence of a poor moist soil itself, and seems to be chiefly nourished by a constant damp which it creates among its own stems. However, it falls rapidly into decay, can impart little nourishment, and, being all above the surface, much, if not all, its juices escape in the form of gas. Sprit, the principal production of undrained ground, does not so easily relinquish the soil. It has large creeping roots, which run horizontally through the surface-mould; the

last are very tenacious of life; for any portion of them will grow if in a damp situation. Nor would it be prudent altogether to exterminate sprit from sheep pasture. It rises soon in spring, when there is always great need of it; it is then both nutritious and wholesome; it is also a principal material in out-field hay, and, if well won, is both durable and feeding. But there is a material difference between sprit on drained, and sprit on undrained bog. On the last it is hard and fibrous, rough and austere to the taste, and is altogether rejected by sheep; on the former it is small and green in the stem, soft, mild, and juicy, and as sheep crop it close in spring, it keeps it tender, sweet, and young, a good part of summer. Sheep continue to eat plentifully of it till the soft, luscious grasses spring in the month of June. Not long after this it runs to seed. If it is not cut for hay by the latter end of July, that crop is of no more use. We had been saying above that the grasses which grew on the higher spaces of the hills annually resigned their seeds before the setting in of winter—that these, with other detritus, generally of a mossy nature, were lodged in the flat tracts round the base of the hills; these seeds had been buried up for an indefinite length of time, but the drying, and the consequent warming of the bog by draining, brought the stratum in which they lay to that temperature which induced germination. As the soil was not saturated with matter which formerly had actuated and nourished former herbage, it readily enters the sap-fibres which these seeds throw out in search of nourishment. No doubt a new combination and another temperature are necessary before this can be done. I am convinced, from my own observations, which, indeed, were very artless and uncertain, that the capillary vessels of grasses, &c. have an attractive power over the sap within a certain limit. I have often taken up tufts of sundry grasses, and very often found at the extremity of the sap-fibre three or four very minute grains of dust adhering with rather a kind of force. Every time I sought for this connection I did not, indeed, find it. I, however, frequently found it; and always when I found this connection, I was convinced that the sap-vessels of plants, &c., exercise an attractive power over the soil, and that these fibres were in the act of extracting soluble matter from very minute particles of clay or rather dust.

The proper Structure of the Seeds of Wheat. By Mr John Lawson, Elgin.—As the ears or spikes of wheat may probably be formed before the number of this Journal for July is published, I intend now to offer a remark bearing some reference to my communication on the seeds of wheat, which appeared at page 269, of vol. iv of the former series of this Journal.

My object in doing so is, that they who possess the proper instruments may have an opportunity of making observations on a part of the seed which appears to me to act an important part in the vegetable economy. In the communication already referred to, it will be observed that, in wheat, a sound seed possesses *internally* the structure delineated in the figure, which represents a transverse section of the seed when it is filling with the *milky juice* that afterwards forms the flour of wheat—*e* is an empty space lined with a greenish-coloured border, and, when the seed is examined at the time it is filling with the milky juice, the greenish-coloured border, viewed longitudinally, will appear like a small cup, or, I may say, egg-shaped, while the outer cuticle, *b b b*, appears also like another cup or egg. In fact, the structure of the seed appears as if it were a small cup in the inside of a larger one. The position and *contents* of this inner cup render it probable that *it* is the organ or gland which *secretes the milky juice*.



If this should prove to be the case, its importance to the plant will at once appear, and probably on its healthy or unhealthy action, or its partial change of structure, the quality of the seed may much depend. We see, in the communication aboved referred to, that when this organ is so much altered, or, perhaps I may say, obliterated, as it appears to be in a *smut ball*, that no milky juice is formed in the seed. A less degree of alteration in its structure may produce a change in the nature of the milky juice, and may not the substance known as *ergot* of rye, and the blackish horny substance which sometimes appears in a seed of barley, depend on the altered structure of this organ? There are various other effects which an alteration in the part now referred to might produce, but it is unnecessary at present to enter farther into detail, as its uses may be more accurately known by the examination and comparison of healthy and unhealthy seeds.

It may be remarked, in conclusion, that it is into the *interior* of this organ that the milky juice flows; and while there is a contraction of it at one part, it expands as it fills with the milky juice, like a bladder that is inflated, till at last, when full, it comes in contact with the cuticle, or outer covering of the seed, which the partial emptiness of the young seed, from its centre to its circumference, permits it to effect.

On Population in England and Wales, from 1801 *to* 1841. In a letter to the Right Hon. Sir Robert Peel, Bart., M.P., by W. KEER BROWN, Esq., Folkestone.—On a former occasion, I had

the honour to submit to your consideration, "A Statistical Calculation on the Estimated Quantity and Division of Land—the Population and Estimated Annual Value of Agricultural Produce in England—on the Question of Taxation upon the Agricultural Interest."*

In that calculation, I referred to the population in England as it appeared by the census of 1831, which, within a fraction, then was 13,000,000; but the census of 1841, which I have since seen, gives the population of England 15,110,570, being an increase of 2,010,570 since 1831. The combined population of England and Wales was, in 1831, 13,894,569, and for 1841, as by the total of the census, 15,984,573, being an increase for England and Wales of 2,090,174 persons.

The population in England and Wales was, in 1801, 8,872,980, and in 1841, 15,984,573, being an increase of 7,111,763, or about 80 per cent. on 8,872,980 in forty years. But the ratio of *compound* increment appears to have declined since 1821. Between 1801 and 1811 this increment was 15 per cent.; from 1811 to 1821 it rose to 18 per cent.; but from 1821 to 1831 it declined to 16 per cent., and from 1831 to 1841 it further declined to 15 per cent., which was the ratio from 1801 to 1811, taking for granted that the censuses from 1801 to 1841 have been correct as to totals. I am not here adverting to classifications, which equally involve grave rational considerations.

If, therefore, the totals of the census from 1801 to 1841 be correct, and my calculations equally so, the declension in the ratio of increment of population, which I have indicated, completely nullifies the first principle of the Malthusian hypothesis, that every twenty-five years population multiplies in the ratio of 1, 2, 4, 8; whilst its corollary, that the capabilities to meet the demands for food only progresses as 1, 2, 3, 4 has equally proved fallacious in this country; as the agricultural means of supply in the country have, since 1801, (forty years,) mainly kept pace with the demand. For admitting that positively the importations of foreign grain, &c. have, since 1801, been considerable, yet, relatively, or as compared with the home supply, they have amounted only to a fraction. The deductions, moreover, of the ultra political economists, from the delusive hypothesis of Dr Malthus, of the necessity of a repeal of the Corn-laws, arising from the assumed inadequacy of the country to provide for the wants of its increasing population, are as inconclusive as the premises whence they are derived. Thus, although the positive increase of population since 1801 is an argument, on the one hand, against a protective system approaching prohibition, on

* *Vide* "Journal of Agriculture," New Series, for July, 1843—"Farmers' Note-Book, No. I."

r, the reaction in the ratio of compound increment since a still stronger one (and there are others still stronger, this did not exist) against a repeal of the Corn-laws.

these considerations, the principle of the *via media* more firmly established, viz., that such "Protection to ire be permanently incorporated with the general national , as that the *minimum* of foreign importation of foreign iral produce does not tend to diminish the *maximum* of *rom the only legitimate and truly national source—the agricultural capital and enterprize of the United King-*

d, so far from the population of England and Wales progressed according to the mischievous hypothesis of thus, it is a problem whether it will even double itself ialf a century from 1801. I call the hypothesis mis-, for, though unfounded both in its first principle and rollary, it has been partly adopted as correct by a large of the community. There is no doubt, however, that, the vicissitudes of seasons—which no human means can bviate, although they may correct, to a certain extent—ntry is capable of sustaining itself, from internal re- for a lengthened period, comparatively, provided its ire is not placed in a state of retrogression, *(of which the s imminent,)* through the insane views and practical ob- the ultra-political economists.

y be admitted, without prejudice, that the very salutary emigration and colonization has, in a degree, tended to the hypothetical compound ratio of increment of popu- iccording to Dr Malthus. But even if this check had rvened, the compound ratio would never have been car- he extent indicated.

of compound Increment of Population in England and Wales.

6	population, 1811.
0	the same in 1801.
6	increment on 8,872,980—15 per cent.
5	population, 1821.
6	the same, 1811.
9	increment on 10,163,876—18 per cent.

* "A russet stole was o'er her shoulders thrown;
A russet kirtle fence'd the nipping air:
'Twas simple russet, *but it was her own.*
'Twas her own country bred the flocks so fair,
'Twas her own labour did the fleece prepare."

13,894,569	population, 1831.
11,978,875	the same, 1821.
1,915,694	increment on 11,978,875—16 per cent.
15,984,743	population, 1841.
13,894,569	the same, 1831.
2,090,174	increment on 13,894,569—15 per cent.

Additional calculations in refutation of the hypothesis of Dr Malthus on increase of Population.

18,074,917	population, 1851, (England and Wales.)
15,984,743	the same, 1841.
2,090,174	increment on 15,984,743—13 per cent.

This calculation is made upon the supposition that the increase of population may, in England and Wales, be the same between 1841 and 1851 as it was between 1831 and 1841. Should such be the case, and there is no reason to assume that it will be materially otherwise, then the population of England and Wales will have doubled itself, and may be a trifle over, within the half century from 1801 to 1851.

Population, 1851, - - - - -		18,074,917
Population in 1801, - - -	8,872 980	
Double in 1851, - - - - -		17.745,960
Excess over population doubled from 1801 to 1851,		328,957

But although the population will have doubled itself, and may be a trifle over, in England and Wales, in *fifty* years, from 1801 to 1851, by this calculation, yet, with a population of 18,074,917 in 1851, increasing on *simple* increment of 2,000,000 each ten years, from 1851, it would take ninety years to double itself, in place of *fifty* years, as from 1801 to 1851. There is, however, no reason to believe but that, as the *compound* increment of population increased from 1801 to 1821, and declined from 1821 to 1841, the fall will go on to the *simple* increment, and the population of the country will become somewhat stationary within a given period. This is a cogent reason for conferring all the privileges of the mother country upon those who become colonists, that population may proportionably increase in the colonies, and become an integral part with that of the mother country.

Nothing in the order of political economy is stationary—what does not progress retrogrades. The wealth and strength of a country consist in its population, and increase takes its rise in agriculture, as the primary source of exchangeable value. If

tion then decline from illegitimate causes, it is a proof of
it national decay. If a population has increased beyond a
ratio, through over stimulus, within a given period, as
ly was the case during the last war, but returns to a more
state, by due legislation, it is a sign of continued inherent
l strength.
population of England and Wales, up to the last census,
from 1791 to 1841, about doubled itself, as it will, with-
ch variation double itself from 1801 to 1851, whilst in
the population has only about doubled itself within 150

ulation, shewing what the population of England and s would probably have arrived at in 1851, *according to the hesis of Dr Malthus, of a compound ratio of increment of* 4, 8—

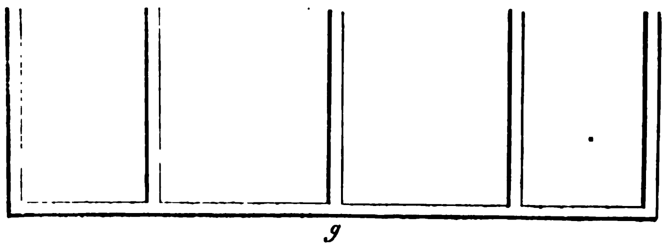
76	population, 1811.	
80	the same, 1801.	
96	increment on 8,872,980—15 per cent.	
75	population, 1821.	
76	the same, 1811.	
00	increment on 10,163,876—18 per cent.	Compound ratio of increment. 1. 3 per cent.
75	population, 1831.	
75	the same, 1821.	
00	increment on 11,978,875—24 per cent.	2. 6 per cent.
9	population, 1841.	
75	the same, 1831.	
14	increment on 14,758,875—36 per cent.	3. 12 per cent.
9	population, 1851.	
9	the same, 1841.	
0	increment on 20,072,019. 60 per cent.	4. 24 per cent.

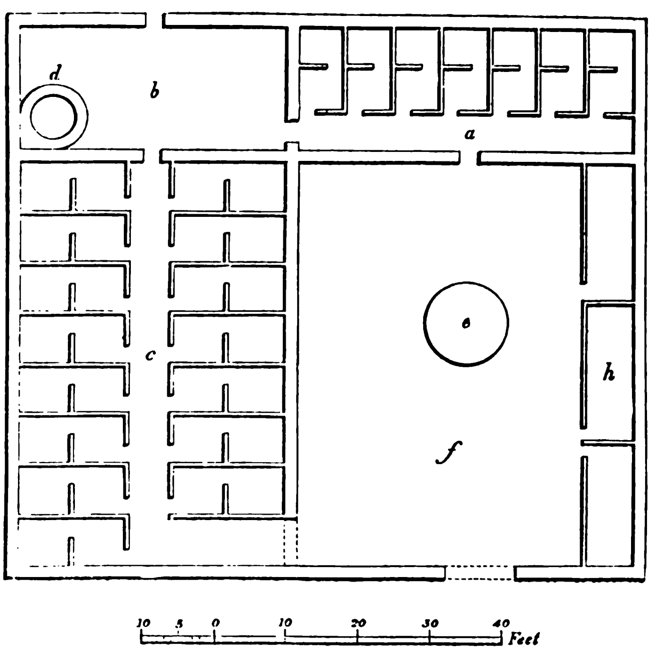
ctual population of England and Wales will be in 1851
3,074,919, and the compound increment about 13 per
But, according to the Malthusian hypothesis, the illusive
on of fallacies of more than a quarter of a century stand-
ould have reached in fifty years, not in twenty-five years,
ould again nearly have doubled itself in fifty years—
19; and the compound increment would be 60 per cent.
of 13 per cent.; and from 1851 to 1861, the increase
e to 108 per cent. on the population of 1851. So much
althus.

Such an hypothesis may do very well for the amusement of the closet, or the fallacious base of still more fallacious deductions in the lecture-room or on the hustings, where *El Dorado schemes* are the order of the day. But to have had the "isle frightened from its propriety," as it were, by a *great moral Ogre*, as has been the case, is *bad*. To have it had practically assumed that the population of the country was so rapidly progressing beyond its internal means of subsistence, according to the Malthusian hypothesis—*worse*. Indeed such doctrines, in any practical sense, should experience all that exposure and reprobation which their mischievous influence on the property and social peace of the country so justly deserves.

Description of a Piggery, at Lascoed Pont Senny. Planned and executed by Mr J. Donaldson, Land-Steward to A. M. Storry, Esq., Brecon, South Wales.—This piggery is constructed for the purpose of breeding and feeding on a scale to suit a farm of 600 acres of turnip soil in an inland situation, where convenient markets render easy the disposal both of fat and lean stock. The seven sties, *a*, in the annexed cut, on the end of the steaming-house, *b*, accommodate 1 boar and 6 brood sows, which are calculated to produce yearly 100 pigs, 60 of which will be fattened from September till April, in the 15 sties, *c*, placed in two rows, and which contain 2 hogs in each apartment. The rest will be sold as stores. The yearly rental will be from £200 to £250, according to the prices of the produce. The steamed food will consist of potatoes and meals, with grain to finish, and conveyed to the sties along a paved road in a small four-wheeled waggon. The steamer, *d*, also cooks potatoes for work-horses, and chaff for milch cows, and thus applies the original cost to several purposes, and fully employs a man. The store pigs are fed in summer with clovers and vetches, and in winter with roots, raw and steamed. Water is brought to the steaming-house in a pipe from the farm-yards, which are all supplied by ball-cocks from elevated casks, fed by a forcing pump; a pipe underneath conveys the water from the potato washer to the pond, *e*, in the store-yard, *f*, whence it passes to the lower corner of the yard, and there, meeting with the collected moisture of the whole area of the piggery, falls through an iron grate into a paved culvert, and is conveyed to the manure pit, to which the liquid of the farmery, *g*, is collected by a drain along the side of the road—*h* are sheds opening into the store-yard, *f*. The cost of this piggery will vary from £80 to £100, according to the price of labour and materials, and if the roof be tiles or slates. The steaming-house is floored above for holding meals and grains for steaming, and the

ots are laid on the ground-floor, and let in from carts by a out hole in the wall.





Mixing of Soils. By Mr Peter Mackenzie, West Plean, Stirng.—Perhaps an account of some operations that we have done the way of improving soils, and which we have watched for veral years, may not be without interest to some of our readers. The operation may be arranged under five heads. The first peration was an attempt to improve a light soil by means of hat was formerly a tenacious subsoil.

The sandy soil was in grass some years before the clay was put on it. In the autumn it was dug up in ridges two feet wide at bottom, and during winter the clay was wheeled upon it, by means of wheelbarrows—it was put between the ridges—the ridges then afterwards levelled—and the ground dug in the spring. In digging, we found it would have been better to have levelled the ridges before the clay had been put on, for the spade scarcely reached the bottom of the clay at times, and it was not so well mixed as I would have liked it. As nearly as I could calculate, the thickness of the clay, on an average, would be about five or six inches. It was afterwards dunged with stable manure, and again dug. The crops were not of first-rate quality, and the ground was stiff to work. The second year it was ridged, and in spring was sown with pease. The crop of pease was good, but still the ground was difficult to work. In the third year it was trenched, and, in trenching, care was taken to mix a considerable quantity of the sand with the clay, to the depth of two feet. Since the soil was trenched it has become a good garden soil, and, with ordinary dunging, produces good crops of vegetables. I may state that a quickset hedge was planted in three different soils, namely, a peat soil, a sandy soil, and one similar to the one described, before it was trenched. In the peat and sandy soil, the plants grew well, in the other they were weak and stunted, and, in order to nourish them so as to become a fence, they required a good dunging with well-prepared stable manure. The clay was as bad as could well be conceived, and, to make it good for growing crop on it, required both time and labour, and perhaps one-half less dung than what was used in the above experiment.

2. The second operation was an attempt to improve peat earth by means of what was formerly a sandy clay subsoil.

Having learned, by former experience, not to deal too freely with bad materials, although they appeared to answer the purpose better than the tenacious clay used on a former occasion, the surface of the peat was levelled, and the material laid on about four inches thick. It was well mixed with the peat when dug, taking little before the spade, and breaking the peat well as we went along. It was afterwards dunged and dug over again, and it was also well drained. The greatest proportion of garden crops do well in this soil. Celery thrives uncommonly well, as well as pease, turnips, potatoes, and cabbages, and also horse radish, although this will grow almost anywhere; but in my trials in various soils, I have never been able to please cooks so well as with that which grew in this soil. I have never succeeded in growing good carrots in it—they being generally stunted and worm eaten. The earth put upon the peat has given it sta-

ity, and it has become a very useful garden soil, with considerly less expense and labour than what was employed on the ıdy soil.

3. The third operation was an attempt to improve what was once ıtiff clayey subsoil, by means of peat, road scrapings, and dung. We are often told that there exists a close relation between the l and subsoil of a field, but I think the relation, in some cases, ıy be compared to that which exists between a green-gage ım and a sloe; and those who attempt converting a stiff argil-eous subsoil into a pliable working state will find it a labour some difficulty. It frequently happens, in the course of ɔund-working, that heights have to be removed and hollows ed up, and cuts made along the sides of hills, so that the ɔund-worker has many opportunities of examining the various ls and subsoils among which he labours; and, if he takes an erest in the cultivation of plants, he will be able to say someing about their progress in the various situations in which they ɔ placed. About nine or ten years ago, the soil was removed m part of a field through which an approach was making, in ler that it might have the slope that it required; a portion of ɔund on one side of the approach required also that soil should removed. What was formerly the subsoil now became the face. It was well drained, and afterwards dug over in a rough y, that the weather might act upon it; and, before planting it th shrubs, it was dug again, with a considerable quantity of ıt laid upon it. It was also dug in the course of two years. most every plant was dead, and those that had any life remain- were rapidly parting with it. However, they were removed fore they were fit for burning, the ground again dug, and a er of lime rubbish put on, with several cart-loads of road-apings and peat. These ingredients were blended together in nter, the ground was again planted with shrubs, which have ntinued to live, but do not grow so vigorously as shrubs in ne places. Grass grows well in such a soil as the one just scribed.

4. The fourth operation was an attempt to improve what was ce a stiff clayey subsoil, by means of the clearings of ponds. The sediment of ponds consists chiefly of sand and minutely ided organic matter. It was carted upon the clayey soil, after was taken from the pond, and allowed to dry for some time in sun. The clay was also turned several times, for the weather act upon it. After the sandy matter was spread, it was dug and planted with young evergreens, chiefly common laurels d Portugal laurels. The greater part of the plants died, d what remained were removed to another situation. The ɔund was afterwards dunged and dug, and planted with pota-

toes in the proper season. The crop of potatoes was light, but the quality good; but the object of planting potatoes was to work the soil. It was a second time dunged and planted with potatoes—it yielded a better crop the second time than it did the first. It was dug after the potatoes were off the ground, and during winter and spring it was planted with shrubs of a larger size than those which were first planted and failed; they had good balls of earth about their roots, and are now growing very well.

A hedge was also planted in this soil, which made a very sorrowful appearance for some time. A trench was dug at the back of the hedge and filled three parts full of well rotted dung; the dung was covered with earth, and the hedge has grown well since. We may here remark that the cause of the death of the young shrubs was not altogether owing to the soil in which they were planted; we believe that it was partly owing to the want of a proper training of the plants for the soil. Young shrubs, taken from a rich soil and sheltered situation, and perhaps growing in a crowded manner, will not stand the same degree of cold and hunger in an exposed aspect that others will, which have been gradually trained to it. For it is well known that the same species of plants will grow in different degrees of temperature, and in different altitudes, when brought gradually to such a state; but when the change is made rapidly, it often causes the death of the plants. Perhaps if these things were more attended to by planters of forest trees, and gardeners in planting their shrubberies, there would be fewer blanks to make up.

5. The fifth and last operation which we will notice at present, was an attempt to improve what was formerly a clayey subsoil, by means of solar and atmospheric influence.

The earth in this experiment was part of a bank, at an angle of about 30°; the ground was dug, and afterwards smoothed for sowing grass upon it; the grass grew, was weak and thin during summer, and in winter was thrown out by the frost, so that in spring the ground was ready for sowing again; for none remained except a small tuft here and there;—the sowing was repeated several times, but the surface never remained green until turf was cut and laid upon it.

It is no uncommon thing to hear some of those who cultivate the soil assert that it is a good thing to bury the good and bring the bad soil to the surface, that it may be improved. Before such a transition is attempted, they ought to be very well acquainted with the nature of the subsoil they have to deal with; for I have known many repent of their folly when it was too late. In trenching, they brought too much of the bad stuff to the top, and it was a long time afterwards before crops would grow freely. It is a good

ıg to have a deep soil to grow crops of various descriptions but where such tough binding subsoil exists, it ought to be ıroved downwards; for it commonly happens, after much trou- and expense have been expended in endeavouring to improve h land, it remains a stiff binding soil.

AGRICULTURAL REPORT.

February 1844.

[HIS number of the Journal appearing a month before its usual ıe, in order to facilitate the publication of the Highland and ricultural Society's List of Premiums for the current year, our ›sent report will only refer to the two by-past months; and may commence by saying that such an equanimity of atmos- erical phenomena has been exhibited for the last two months, ıt we never remember to have witnessed in any previous ıter. Through the entire course of December the barometer ʼer fell below 30 inches, the average being above 30.1. The ıe was nearly similar in January; and the average tempera- 'e of December was above that of last June. The sun, we ieve, has shone more hours in those two months of the short- days than during the longest days of last June and July. Still ›re have been occasional rains, winds, frosts, and even falls of ›w, but all have come and gone so pleasantly as entirely to dis- ›iate them from the idea of *storm*.

The effects of such weather upon the vegetable world have ›n remarkable. Several spring flowers have appeared—the lyanthus, the auricula, and the Daphne mezereon. The old is ploughing down as green as an emerald, the young grass sh and growing, the young wheat pushing on, though not › far advanced for the season—its young braird penetrating › soil with all the vigour of autumn—and, on this account, › a day is lost in sowing wheat after turnips, nor will there til the end of February. The ordinary field-work is so far ʼanced that the farmer is impatiently watching the clearing the turnip-land by the sheep, to keep his ploughs employed. hen spring arrives, there will be nothing to do but to sow, and › seed-time will soon be over. The smallness of the turnip b was complained of in autumn; the subsequent mild weather, ›vever, has enlarged it considerably; and the consequence has ›n, that the medium-sized white turnips have fed both cattle l sheep better than for years past, whilst the Swedish have l time to attain to a good size—and the natural effect all has been to supply the meat market with early and well- l beef and mutton. Certainly, sheep on turnip never had a er season, so their wool as well as their mutton may be ex-

pected to be of the best quality. The price of grain has remarkably steady, as may be seen in the tables, and the at such a mark as to satisfy the farmer; so that, with of good quality, and at fair prices, and with most desirable ther in which to feed his stock in the best condition, the Sc farmer enjoys this season an ease at heart he has not felt for Surely it cannot enhance the welfare of the country to selfish intermeddlers to vex him in his well-earned enjoy That he is galled, is evinced in the circumstance of his joini English friends, with great good will, to have word about their noisy opponents; and we have no doubt the united will now, like rational men, have the last word, too, with th

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Qua ters and Years ended on the 5th November, 1843, and 5th of January, 1844 shewing the Increase and Decrease on each head thereof.

	Quarters ending January 5.		Increase.	Decrease.	Years ending January 5.		Increase.	D
	1943.	1844.			1843.	1844.		
	L.	L.	L.	L.	L.	L.	L.	
Customs, ...	4,214,089	4,766,968	552,879	.	19,075,310	19,073,219	. .	
Excise, ...	3,022,043	3,030,771	8,763	. .	11,407,304	11,794,807	387,503	.
Stamps, ...	1,561,754	1,523,653	. .	38,101	6,491,100	6,426,155	. .	
Taxes, ...	1,886,163	1,868,857	. .	17,806	4,273,592	4,190,486	. .	
Post-Office, . .	141,000	148,000	7,000	. .	605,000	592,000	. .	
Miscellaneous, .	61,573	41,917	. .	19,656	712,411	1,752,241	1,039,830	.
Property Tax, .	257,212	454,415	197,203	. .	571,056	5,249,260	4,678,204	.
	11,143,794	11,834,581	765,845	75,563	43,135,773	49 078,168	6,105,537	1
	Deduct Decrease.		75,563		Deduct Decrease.		163,142	
	Increase on the Qr.		690,282		Increase on the Year.		5,942,395	

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date.	Markets.	Wheat.		Barley.		Oats.		Rye.		Pease.		B
1843. Dec.	Danzig.	33/	to 40/	16/6	to 19/	9/6	to 11/6	19/	to 21/	20/6	to 25/	17/
1844. Jan.	..	35/	42/6	17/	20/6	10/	12/	19/	21/6	21/	25/6	18/
1843. Dec.	Hamburg.	32/6	41/	19/	24/	10/6	12/6	20/6	22/	20/	23/	19/6
1844. Jan.	..	33/	41/6	20/	25/6	11/	13/6	21/6	23/	21/	23/6	19/
1843. Dec.	Bremen.	36/	42/	18/6	22/6	11/	14/6	20/	22/6	18/6	23/	18/
1844. Jan.	..	36/6	40/	19/	24/	11/6	15/	20/6	23/6	19/6	24/	18/6
1843. Dec.	Königsburg.	34/6	39/	15/6	19/	10/6	12/	17/	21/	17/	21/	18/
1844. Jan.	..	35/	41/6	16/6	21/6	11/6	13/6	17/6	23/	17/6	22/6	18/6

Freights from 2/6 to 4/ per quarter.

TABLE OF PRICES, &c.

rices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

.	Barley.		Oats.		Rye.		Pease.		Beans.	
.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1	33	7	19	10	31	3	31	8	31	3
3	33	4	19	6	29	6	32	3	31	7
1	34	6	19	8	30	4	31	6	31	2
3	33	3	19	7	29	10	31	4	31	4
3	34	3	19	5	28	7	31	8	31	6
0	32	5	19	6	29	2	30	6	29	6
1	34	8	20	1	29	6	29	10	28	5
0	33	1	19	11	29	4	29	6	28	7
5	33	10	19	10	29	1	29	2	28	9

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Bean-	
1843.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 6.	49	3	31	9	18	9	30	6	30	11
13.	48	9	31	7	18	8	30	0	30	3
20.	49	5	32	4	19	8	30	6	30	10
27.	49	7	33	0	19	4	29	6	29	1
1844.										
Jan. 3.	52	6	33	10	19	5	29	8	30	0
10.	53	7	34	0	19	7	29	8	30	2
17.	53	4	33	8	19	7	30	6	31	0
24.	52	10	33	9	19	8	30	8	31	2
31.	53	4	33	6	20	2	30	3	30	8

LIVERPOOL.

...at.	Barley.		Oats.		Rye.		Pease.		Beans.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
9	29	3	17	10	28	6	32	6	33	6
10	31	4	17	2	29	4	32	4	31	6
6	28	10	17	0	29	2	33	2	33	11
8	34	2	16	10	29	8	32	8	33	1
6	34	10	22	1	28	7	31	9	31	4
10	34	9	17	6	28	10	31	6	32	0
3	28	7	18	1	29	4	32	4	33	8
9	29	9	17	11	29	10	32	0	31	1
6	31	6	19	2	28	10	30	10	29	2

DUBLIN.

Date.	Wheat per Barrel 20 St.		Barley per Barrel 16 St.		Bear per Barrel 17 St.		Oats per Barrel 14 St.		Flour, per ... 9 St.	
1843.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 1.	27	1	14	8	11	9	9	3	17	4
8.	27	3	14	11	12	2	9	3	17	1
15.	28	7	15	1	12	6	9	5	17	0
22.	27	7	15	3	12	9	9	3	17	0
29.	26	3	15	5	12	11	9	0	16	9
1844.										
Jan. 5.	26	2	15	3	13	0	9	1	16	2
12.	27	5	17	0	14	6	9	6	17	3
19.	29	3	16	9	14	2	10	5	17	11
26.	29	8	15	8	13	8	9	11	17	1

...ewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. ...8, and 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties payable ...EIGN CORN: the Duties payable thereon, from Dec. 1843, to Jan. 1844.

Wheat.			Barley.						Oats.						Rye.						Pease.						Beans.					
Aggregate Average.	Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
2	19	0	31	3	31	8	7	0	19	2	19	6	8	0	30	6	29	10	11	6	33	8	33	6	9	0	32	6	31	10	10	6
4	19	0	31	8	31	10	7	0	19	0	18	8	8	0	30	7	30	0	10	6	33	6	33	7	9	6	31	10	31	10	10	6
5	19	0	31	8	32	0	6	0	18	8	18	10	8	0	30	1	30	0	10	6	33	0	33	8	9	6	32	0	32	0	10	6
3	19	0	32	0	32	0	6	0	18	[illegible]	18	10	8	0	30	0	30	2	10	6	32	4	33	5	9	6	31	6	32	0	10	6
11	20	0	32	2	32	0	6	0	18	7	18	9	8	0	29	9	30	3	10	6	30	10	32	10	10	6	30	10	31	10	10	6
4	20	0	32	3	32	2	6	0	18	5	18	8	8	0	31	4	31	5	10	6	31	6	32	6	10	6	30	1	31	5	10	6
5	20	0	32	7	32	1	6	0	18	3	18	7	8	0	30	8	30	5	10	6	30	7	32	0	10	6	29	5	30	11	10	6
6	20	0	33	0	32	3	6	0	18	9	18	8	8	0	30	5	30	10	10	6	31	0	31	7	10	6	29	8	30	7	10	6
6	20	0	33	7	32	7	6	0	18	10	18	7	8	0	31	7	31	2	10	6	30	3	31	1	10	6	29	6	30	2	10	6

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Qua Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Q upon which duties have been paid for home-consumption, during the same Month; and th ities remaining in Warehouse at the close thereof, from 5th December, 1843, to 5th January,

	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAR	
Month ending	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.
Dec. 5, 1843.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . .	56,801 0	4,900 2	61,701 2	840 1	4,900 2	5,740 3	160,784 4	426 6
Barley, . .	14,460 3	0 1	11,460 4	12,509 2	0 1	12,509 3	11,500 3	. .
Oats, . . .	18,985 2	97 4	19,082 6	1,172 3	97 4	1,269 7	61,067 1	. .
Rye, ...	2.212 3	. .	2,212 3	1 0	. .	1 0	2,225 6	. .
Pease, . .	9,889 6	1,1.9 1	11,098 7	4,864 5	841 6	5,706 3	25,293 4	746 0
Beans, . .	317 1	. .	317 1	8,431 7	. .	8,431 7	90,528 1	. .
Totals,	99,675 7	6,197 0	105,872 7	27,819 2	5,839 5	33,658 7	351,500 3	1,172 6
Jan. 5, 1844.								
Wheat, . .	26,107 3	8,658 6	31,766 1	1,131 7	7,815 1	8,947 0	181,700 0	1,270 5
Barley, . .	8,850 5	833 1	9,683 6	7,253 5	833 1	8,086 6	12,047 2	. .
Oats, . .	1,092 7	. .	1,062 7	1,574 5	. .	1,574 5	60,117 3	. .
Rye, . .	. .	. .	. .	. .	. .	. .	2,225 6	. .
Pease, . .	3,895 4	3,021 2	6,907 6	3,197 1	3,372 2	6,569 3	25,853 0	396 0
Beans, . .	344 6	. .	344 6	5,528 1	. .	5,528 1	85,520 5	. .
Totals,	40,261 1	12,513 1	52,763 2	18,679 3	12,020 4	30,699 7	367,912 0	1,656 3
Dec. 5, 1843.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, . .	25,877 0 22	80,811 2 23	106,718 3 17	208 2 5	80,513 2 13	80,722 0 18	77,069 3 22	2,125 1 16
Oatmeal,	. .	3,198 2 26	3,198 2 24	. .	2,923 1 18	2,923 1 18	7 3 19	277 1 6
Totals,	25,877 0 22	84,040 1 19	109,917 2 13	208 2 5	83,437 0 3	83,645 2 8	77,277 3 12	2,402 2 22
Jan. 5, 1844								
Flour, . .	13,625 0 4	109,370 2 2	122,995 2 6	73 2 16	106,489 0 6	106,562 2 22	87,375 1 11	4,906 2 18
Oatmeal,	. .	95 3 5	95 3 5	. .	95 3 5	95 3 5	7 3 19	277 1 6
Totals,	13,625 0 4	109,466 1 7	123,091 1 11	73 2 16	106,584 3 11	106,658 1 27	87,383 1 1	5,183 3 24

PRICES of BUTCHER-MEAT.

Date.	LONDON, *Per Stone of 14 lb.*		LIVERPOOL, *Per Stone of 14 lb.*		MORPETH, *Per Stone of 14 lb.*		EDINBURGH, *Per Stone of 14 lb.*		GLA *Per St*
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.
1843. Dec.	5/6 to 6/9	5/6 to 7/9	5/6 to 6/9	5/ to 7/3	5/3 to 6/9	5/3 to 6/9	5/3 to 6/6	5/6 to 6/6	5/6 to 6/
1844. Jan.	5/9 7/3	5/9 7/9	5/6 7/0	5/3 7/6	5/6 7/0	5/6 7/3	5/6 6/9	5/6 7/	5/6 7

PRICES of English and Scotch WOOL.

English, per 14 lb.

Merino, ...	15/ to	20/
in grease, . . .	13/6	15/6
South Down, ...	14/6	18/6
Half Bred, ...	13/	15/
Leicester Hogg, . . .	15/9	19/6
Ewe and Hogg, .	12/6	16/
Locks, ...	8/6	9/6
Moor, ...	6/	7/

Scotch, per 14 lb.

Leicester Hogg, . .	13/6 to	1[illegible]
Ewe and Hogg, . .	12/6	1[illegible]
Cheviot, white, . . .	12/3	1[illegible]
Laid, washed, . .	8/6	1[illegible]
unwashed, . .	7/[illegible]	9[illegible]
Moor, white, . . .	6/6	8[illegible]
Laid, washed, . .	5/6	7[illegible]
unwashed, . .	5/	6/

AGRICULTURE AND GEOLOGY.—THE PALŒOZOIC SYSTEM.

By Joshua Trimmer, F.G.S., &c.

The time is gone by when a geological article would have been deemed unsuited to the pages of an agricultural journal. The connexion of geology with agriculture is now very generally admitted; and there even exists, in some quarters, a disposition to exaggerate the importance of the connexion. Geology is dependant for aid on so many sciences, that their merits are often ascribed to it, and it gains credit for much which, in reality, belongs to the companions with which it associates, more particularly chemistry. The inconsiderate assertions put forward by some, who, it is evident, have very little acquaintance with the subject, induce others who, it is equally evident, possess less, to deny that the science is capable of affording the aid to those engaged in the cultivation, improvement, and valuation of land, which it really has the power to bestow. It is not, however, my present intention to vindicate the legitimate claims of geology as an assistant to agriculture; but rather to give a brief outline of the present state of our knowledge respecting that important group of rocks, the older secondary transition or Palœozoic strata, some account of which will, doubtless, be acceptable to those agriculturists who are turning their attention to geology; because the classification and nomenclature of this group have long been in an unsettled state, and have undergone so many important modifications of late, that the elementary works written while those modifications were in progress, speak each a different language on this subject, calculated, without some explanation, to puzzle, mislead, and dishearten the student.

I shall preface the history which I propose to give of the investigations which have led to the present arrangement of the Palœozoic rocks with some observations on geological classification and nomenclature in general. The most obvious natural division which the rocks composing the crust of the earth present is into stratified and unstratified, and the unstratified rocks, again, are naturally divisible into fossiliferous and non-fossiliferous; the former division including those strata which, though themselves destitute of organic remains, alternate with others which contain them, in the same manner that, in the deposits of our present seas, we find some beds highly charged with the exuviæ of plants and animals, while others are wholly destitute of them. Mineralogically considered, the stratified rocks consist but of three varieties—siliceous, argillaceous, and calcareous strata—in alternations so often repeated that the details become absolutely bewildering; and, for the purpose of assisting the

memory, it is necessary to arrange them into a few principal groups, with subordinate divisions. The first attempts at classification were founded on mineral characters, which proved to be only good local guides, and were found to have resulted from accidental circumstances which had, at different times, affected almost every portion of the series. Interruption in the continuity of deposit by disturbances which produce what geologists call unconformability between different sets of strata, causing one group to rest in horizontal beds on the upturned edges of others, though frequently extending over very extensive areas, are still only local accidents, which cannot be made the basis of a general classification. The study of the remains of plants and animals imbedded in the stratified rocks shewed that certain groups of them are peculiar to certain groups of strata, and that, as we descend in the series, the forms of organic life depart more and more from those existing on the earth, till we reach a point at which they cease to be met with at all. Organic remains have, therefore, long been found to be the best guides to the classification of rocks, and to the determination of the identity of contemporaneous deposits in distant parts of the world. The divisions, however, into which, by their aid, for the convenience of classification, we divide the strata composing the earth's crust, are more arbitrary than those of nature; for the fossiliferous series, when unbroken by those local disturbances before alluded to, form one sequence of deposits, passing into one another by almost insensible gradations; one race of beings gradually becoming extinct, and new races being as gradually introduced, attaining a high degree of developement, and then, in their turn, gradually disappearing, to be replaced by others. As we find a zoological passage between the subordinate members of each great group possessing a suite of fossils which have a common general character, so we find intermediate beds, connecting, by similar transitions, those contiguous larger groups which we separate from one another, because of the general dissimilarity of their organic contents. The student who consults elementary works on geology, from twenty to twenty-five years old, will find rocks divided into four principal classes, named Primitive, Transition, Secondary, and Tertiary. Werner gave currency to the three former terms. Those of primitive and secondary he had adopted from earlier writers, who defined the primitive rocks to be those which contained no organic remains or fragments of other rocks, and which they, therefore, regarded as having constituted the original nucleus of the globe. The derivative origin of the secondary rocks is shewn by their fragmentary composition and the remains of organized bodi[illegible] they contain. [illegible] intermediate in character between these [illegible] large group of

rocks partaking of the crystalline character of the primitive and the fragmentary character of the secondary strata; and organic remains are found in them, though in less abundance than in the strata which repose upon them. Werner, therefore, named them transition, on the supposition that the chaotic fluid, which he imagined to have held the constituents of the primitive rocks in a state of chemical solution, having, by the deposit of those rocks, been brought nearer to the condition of our present ocean, was beginning to become capable of supporting animal life. The secondary rocks were called, also by Werner and his disciples, floctz or flat rocks; because they are spread out in broad sheets, approaching in position more nearly to the horizontal than the primitive and transition groups, which usually occur, in highly inclined beds, on the flanks of mountain chains. The chalk, which constitutes the highest member of the secondary series, was considered by the Wernerians as the most recent regular deposit; those strata of incoherent sand, clay, marl, and gravel, which rest upon it, and which often attain a considerable thickness, being classed with the loose covering of the earth, which was attributed to a transient irruption of the ocean, at a very recent epoch. When the researches of Cuvier and Brongniart had proved that these strata were of great importance, from their zoological relations differing from the secondary strata in containing mammalian remains and a group of shells nearly approaching the character of those of existing seas, these supracretaceous rocks were by them denominated tertiary; and the Wernerians were compelled to divide their floctz rocks into older and newer floctz, the latter answering to the tertiary strata of other writers. Subsequent researches proved that the tertiary strata represented a long epoch, during which great changes took place in organic life. They exhibit a suite of fossils gradually changing from those of the tertiaries of the basins of London and Paris, in which mammalia first make their appearance, and those of extinct genera, accompanied by shells—a proportion of which, not exceeding five per cent. belong to existing species—up to those of the most recent beds of Sicily, the Val d'Arno, the Norwich Crag, and a variety of other local deposits, in which the mammalian remains consist of a mixture of those of existing species and of species either locally or generally extinct; while the molluscs are either wholly of existing species, or contain, at most, about five per cent. which are extinct, or unknown in a recent state.

The secondary strata differed from the tertiary in the circumstances under which they were formed. The former appear to have been spread out in broad sheets, and to have been the deposits of an extensive ocean which, during that epoch, occupied

the greater part of the northern hemisphere. During the tertiary period, however, the gradual increase of land, within that area, reduced the dimensions of that ocean, converting it into gulphs running deeply into the land, or into mediterranean seas and inland lakes. We consequently find it more difficult to determine the age of tertiary than of secondary rocks, by the evidence of actual superposition; because, from their insulated character, it is very rarely that three members of this group occur together. We are, therefore, chiefly guided in determining their age by the approach to existing species which their organic remains exhibit, and the conclusions derived from this source are confirmed by the evidence of superposition whenever it can be obtained. We find, for instance, in one locality, two deposits, *a* and *b*, of which *b* is the uppermost; in another, *a* is wanting, but *c* rests on *b*; and in a third locality *d* rests on *c*. Each of these deposits contains a peculiar group of organic remains, approaching more nearly, as we ascend in the series, to the character of the existing group inhabiting the locality where the deposit occurs; and, therefore, wherever we find an insulated tertiary deposit, we refer it to the age of that part of the series of actually superimposed tertiaries with which it most nearly agrees.

The study of tertiary fossils shews that the existing species of molluscs are older than the existing species of vertebrated animals, that they had a longer duration of existence, and therefore a more extended vertical range through the strata. A provisional zoological classification might have been founded upon either division of the animal kingdom; a perfect classification ought to include the entire fauna and flora of each epoch. For our present arrangement of tertiary strata we are indebted to Mr Lyell. Regarding molluscs as of the most general distribution, and the remains of plants and vertebrated animals as occurring in too few localities, and consisting of too few species to be made the basis of a classification, he arranged the tertiary strata into four groups, the names of which are derived from Greek vords denoting the approach of their organic contents to exis[illegible] ng races. The oldest are the Eocene tertiaries, exhibiting the dawn of existing species of molluscs, the proportion of which to those th[illegible] [illegible]inct does not exceed from 3½ to 5 per cent.; in the [illegible] [illegible]iddle tertiaries, the proportion of recent [illegible]pecies of shell[illegible] [illegible]ts to 20 per cent.; in the Pliocene it is [illegible]5 to [illegible]; and in the Pleistocene, or newer pliocene, [illegible]here ar[illegible] [illegible] than from 5 to 10 per cent. of species which [illegible]re extinc[illegible] [illegible] satisfactory to find that the results of an ex[illegible]ination [illegible] [illegible]ertebrated animals and plants, as far as it has [illegible] [illegible]n accordan[illegible] [illegible]he classification founded on

the proportion of existing species of testacea contained in these tertiary deposits.

The nomenclature and classification of the tertiary strata and of the secondary rocks, down to the new red sandstone, has undergone little alteration for many years, and does not appear likely to be much changed at present. It has been different, however, with the lower part of the secondary series, to the history of which we will now revert. Werner's doctrine of the aqueous origin of granite was warmly controverted by the rival school of Hutton, who contended that it had resulted from a state of fusion, and whose views ultimately triumphed. The igneous origin of granite is proved by its graduating through syenite and hornblende rock into volcanic rocks, and by the changes which it produces on the sedimentary strata in contact with it, which are identical with those produced by heat under pressure. The recent origin of much of the so-called primitive granite is also proved by its sending veins off into the rocks which rest upon it, under such circumstances as to leave no doubt that the pierced and broken rocks are older than that which penetrates them. Granite rocks, when these facts were generally known, came to be regarded as indicating peculiar circumstances accompanying igneous action at various epochs, and not as characteristic of a particular geological epoch; and while all geologists are agreed as to the igneous origin of granite—and some admit that portions of this universally-diffused rock, which constitutes the base on which the stratified series rests, may be part of the first crust which cooled on the surface of a planet once in a state of general incandescence—the difficulty is to point out any granite which can be proved to be older than the earliest of the fossiliferous slates. It became evident, therefore, that the terms primitive and transition were objectionable, as containing erroneous theoretical views, and ought to be abolished; but so thoroughly had the science become imbued with them, so powerful is the force of habit, and so great the disadvantages of changing scientific terms, except with the general concurrence of men of science in all countries, that the attempts of Conybeare in 1822, and of De la Beche in 1830, to introduce a new nomenclature, independent of hypothesis, met with no success. The term primitive, however, was modified into primary, and applied to granite, gneiss, and mica slate; and that of transition continued to be applied to the slate series, though the theoretical views in which it originated were abandoned. To the transition group, however, different limits were assigned by different geologists, some confining it to the slate group, others extending it to the old red sandstone, while others included in it the whole of the carboniferous series.

These different arrangements originated in the local circumstances affecting those rocks, under which different observers studied them. Where, as in England, the slate series has undergone disturbance before the deposit of the old red sandstone, which is of a different mineralogical character, and graduates into the carboniferous series, with which it is conformable, while it rests unconformably on the slate series, it was very natural that it should be separated from that group and included in the carboniferous. In France and Germany, on the other hand, where the break in the sequence of deposit took place after the formation of the old red sandstone, which was observed to graduate into the slate series, and to possess the mineral characters of that group, it was equally natural that it should be classed with it, and separated from the carboniferous. Those geologists, again, who found the whole series, to the termination of the carboniferous group, conformable and graduating into one another, were induced to include those rocks in the transition series.

Now that the organic remains of the slate rocks are better known, it appears that the whole series of deposits, from the oldest fossiliferous rocks to the zechstein or magnesian limestone, immediately above the coal measures, was characterised by peculiar genera of animals and plants, some of which had not expired during the deposit of that rock, though some new forms, afterward to be more extensively developed during the oolitic and cretaceous epochs, then began to make their appearance. To this entire group, therefore, geologists are now beginning to give the name of the Palœozoic system, derived from two Greek words, which mean ancient animals; and thus a classification founded on zoological relations makes the Palœozoic strata identical with the transition group of those continental geologists who used the word in its most extended sense. The term transition, however, from having been employed with so much latitude of expression, has ceased to convey any definite meaning; and it is, therefore, evident that, independently of those other objections arising from the erroneous theoretical views blended with it, it ought to be discontinued. The steps by which we have attained this point have been gradual. It was in the year 1829 that Professor Sedgwick and Mr Murchison commenced the investigation of the *terra incognita* of the English rocks below the old red sandstone. The sequel has shewn that of these, as well as of every other part of the series constituting the earth's crust—if we except the tertiary portion and the new red sandstone, which are less complete than on the Continent—the British islands afford the best examples, and that our country may be regarded as an index geological map of that of Europe. Before that time, no attempt had

been made to divide this vague and chaotic mass of the transition rocks into minor groups, characterised by lithological and zoological characters. It was known, indeed, that organic remains occurred in a few parts of the slates and sandstones of Wales and Devonshire, and that they were more abundant in the limestones of the latter; and some of the continental geologists had described and figured many of the transition fossils of the Eifel and Norway: but the slaty cleavage, so characteristic of these rocks, which has often nearly obliterated the original sedimentary lines, led many geologists to doubt their being stratified, and to consider that, instead of being the result of successive deposits, so apparent in the other secondary strata, they had been formed by a process of crystallization on a grand scale, in a comparatively short space of time. Accordingly we find Professor Sedgwick, in his early papers on the slate rocks of Cambria and Wales, deeming it necessary to offer proofs that they were stratified.

That geologist took for the field of his investigations the lower part of the series, as exhibited in Wales and Westmoreland, while Mr Murchison commenced his operations on the eastern flanks of the Welsh chain, working downwards from the coal measures of Colebrook Dale, Shrewsbury, and the Clee Hills. The result was the establishment of two great groups of rocks, distinguished by mineral and zoological characters. To the upper of these Mr Murchison gave the geographical name of Silurian, from the Silures, a tribe of ancient Britain, who inhabited the region where it was first studied and best developed; the lower group Professor Sedgwick named Cambrian, from its occupying a large area, and attaining a great thickness, in North Wales, in juxtaposition with Mr Murchison's upper group. For the whole series, the latter proposed the name of Protozoic, intimating that it contained the first traces of organic bodies; but, at the suggestion of his fellow-labourer, this was modified to Palæozoic, to provide for the contingency of organic remains being hereafter proved to exist in the gneiss and mica slate group in which some geologists professed to have found them. The Silurian system Mr Murchison was enabled to divide, in Shropshire, into several formations and minor subdivisions, on the evidence of superposition, organic remains, and mineral composition. The following table exhibits a synopsis of these divisions, their lithological characters, organic remains and types, or localities where they are best studied:—

	Formations.	Thickness.	Subdivisions.	Lithological Characters.	Organic Remains.	Types.
UPPER SILURIAN.	Ludlow Formation.	Feet. 2,000	Upper Ludlow Rock.	Slightly micaceous, grey, thin-bedded sandstone.	Corals, Terebratula, Leptæna, or Producta, Orthis, *Pentamerus Knightii*, Lingula, Orbicula, Bellerophon, Homonolotus Knightii.	Ludlow Castle, Aymestry, Woolhope, Sedgeley, west side of the Malvern and Abberley Hills.
			Aymestry Limestone.	Sub-crystalline, grey, or blue argillaceous limestone.		
			Lower Ludlow Rock.	Sandy, liver, or grey, dark-coloured shale and flags, with concretions of earthy limestone.		
	Wenlock Formation.	1,800	Wenlock Limestone.	Highly concretionary, sub-crystalline, grey, and blue limestone.	Corals and crinoidea in great abundance; *Producta depressa*, *Spirifera lineata*, *Euomphilus rugosus*, E. discors, *Orthoceras annulatum*, *Conularia quadrisulcata Calymene Blumenbachii*, C. variolata, Asaphus caudatus.	Wenlock Edge, Woolhope, Dudley, west side of Malvern and Abberley Hills.
			Wenlock Shale.	Argillaceous shale, liver, and dark grey coloured, rarely micaceous, with nodules of earthy limestone.		
LOWER SILURIAN.	Caradoc Formation.	2,500	Caradoc Flags.	Thin-bedded, impure, shelly limestone, and finely laminated, slightly micaceous greenish sandstone.	A few corals and crinoidea; *Pentamerus levis*, Orthis, Terebratula, Leptæna, Nucula.	Horderly, Woolhope, May Hill.
			Caradoc Sandstone.	Thick-bedded, red, purple, green and white freestones; conglomeritic quartzose grits; sandy and gritty limestones.		
	Llandeilo Formation.	1,200	Llandeilo Flags.	Dark-coloured flags, mostly calcareous, with some sandstone and schist.	Several trilobites, *Asaphus Buchii*.	Near Shelve, Shropshire, near Builth, Llandeilo.

It ought to be particularly noted that Mr Murchison did not profess to have extended his investigations to the base of the lower Silurian rocks, which he stated graduated into the Cambrian of Professor Sedgwick.

The following is the first arrangement of the Cambrian strata, framed by the latter geologist from the joint consideration of the types of Wales and Cambria:—

I.—*Upper Cambrian or Plynlymmon Rocks.*

WALES.—*a* Grauwacke and grauwacke slates of great thickness, with some beds of conglomerates.
b Bala limestone, with shells and coral.

CAMBRIA.—*a* Houghill or Kentmere rocks—a great mass of grauwacke resting on alternations of grauwacke and grauwacke slate.
b Coniston limestone, with shells and corals.

II.—*Lower Cambrian or Snowdonian Rocks.*

WALES.—*a* Rocks of Snowdonia—purple, blue, and green slates, fine and coarse grauwacke and conglomerates—organic remains in certain beds—resting on the chlorite slate of Anglesey.

CAMBRIA.—*a* Langdale and Borrowdale rocks—upper part dark flaggy and slaty rocks—middle, fine green slates—bottom, most of the rocks mottled amygdaloidal and fragmentary—1000 yards or more.
b Skiddaw rocks—dark soft slates, with chiastolite towards the bottom, and hornblende in the base—1000 yards.
The Skiddaw group is imperfectly developed in Wales, unless represented by the chlorite slate of Anglesey. They rest on
c Thin strata of gneiss and mica slate, covering granite.

At the time this classification was made, all that was known about the organic remains was, that some of the species were identical with those of Mr Murchison's Silurian rocks, and it was expected, considering the great thickness of the deposits which they presented subjacent to the Silurian, and the long epoch which they might be supposed to represent, that a more minute examination of them would bring to light some new and peculiar forms which would constitute a Cambrian zoological group distinct from the Silurian—an expectation which, we shall see in the sequel, has been disappointed.

The lower Cambrian rocks of Wales and Cambria comprise a thickness of several thousand yards. They consist of numerous alternations of slate and sandstone, with which bands of limestone are occasionally associated. The sandstones often assume a form which the German miners call grauwacke—a fragmentary rock consisting of quartz, jasper, and flinty slate, embedded in a base of clay slate. The rocks of the transition group were, from this circumstance, frequently called the grauwacke or greywacke series. The rocks of the Cambrian system of Professor Sedgwick are distinguished by the paucity of their organic remains, the obscurity of the traces of stratification, the prevalence of slaty cleavage, transverse to the planes of stratification, particularly in the argillaceous portions, and the abundance of porphyry and other felspathic rocks, not only in intrusive masses,

but in beds alternating with the strata, and partaking of their flexures and inclination. The slates and sandstones of the Silurian group are less indurated than those of the Cambrian, exhibiting a greater resemblance to ordinary shales and sandstones than to slate and grauwacke—are less affected by slaty cleavage, except locally in the vicinity of igneous rocks, which occur chiefly as intrusive masses; limestone, also, is of more frequent occurrence.

Such was the state of our knowledge respecting the strata below the old red sandstone till within the last four or five years, and so far the classification of the late transition group appeared complete. Mr Phillips, in his two treatises on geology, published in 1837, included the now fossiliferous strata and the gneiss and mica slate groups with the Cambrian, and Silurian, under the name of primary, chiefly because the sequence of deposit appears not to have been broken by any extensive disturbance till the epoch of the old red sandstone, when the slate rocks were very generally broken up and thrown into inclined positions.

In an elementary work on geology,* published in the beginning of 1841, I limited the term primary to the non-fossiliferous strata, applying that of lower secondary to the fossiliferous strata, from the oldest in which organic remains have been found up to the termination of the coal measures, making the upper secondary include the strata from the magnesian limestone to the chalk. The old red sandstone, regarded, when these investigations commenced, as nearly destitute of organic remains, was found, during their progress, to be locally rich in them; and it became evident that it was quite as much entitled to be classed as a system as the Silurian rocks. Some geologists had even then begun to apply to it the title of the Devonian system, considering the fossiliferous slates and associated limestones of Devon and Cornwall as the representatives and true type of the rocks of that era. As the Devonian controversy, however, had not wholly ceased, I did not consider it advisable, in an elementary work, to deviate from a long-established classification, or to adopt a new nomenclature, until it should have received, if not the universal concurrence of geologists, at any rate the sanction of a very decided majority of them. To the history of the Devonian controversy it is now necessary to advert. It regarded the place in the series to which were to be assigned the slates of Devon and Cornwall, with which, as well as rocks of similar mineral character, on the Rhine and the south of Ireland, were associated beds of culm, and the remains of land plants, many of them of the same species as those of the coal measures. Sir Henry de la Beche, the Director of the Ordnance Geological Survey, placed them on the parallel of

* [illegible] Parker, London. 1841.

the Cambrian and Silurian, in which no land plants had been discovered, if not lower in the series. Mr Murchison and Professor Sedgwick, on the other hand, having extended their observations to these rocks, soon succeeded in convincing geologists that the culmiferous beds of North Devon were the representative of the lower unproductive portion of the carboniferous series of South Wales, thus wresting more than a third of the Devonian peninsula from the domain of the grauwacke. The rocks below these carboniferous strata, which it was admitted by both parties graduated into them, they at first regarded, chiefly on lithological evidence, and from a very cursory acquaintance with their organic remains, as representing the upper and middle of the Cambrian system, with a very slight developement of Silurian rocks in the upper part; observing, however, that, as no fixed line of demarcation could be established between the lower Silurian and upper Cambrian, their zoological contents being very similar, this classification of the lower slate rocks of Devon and Cornwall must only be considered provisional. A more extended examination of their fossil contents by Mr Lonsdale, led him to infer that they are more recent than the Silurian, and that they constitute a natural group, intermediate in character between those of the carboniferous and Silurian systems, the slates and sandstones in which they occur being an enormous developement of the old red sandstone, under a considerable deviation from its ordinary English type. They, therefore, proposed the term Devonian system for a group including the old red sandstone, and constituting a zoological passage from the Silurian into the carboniferous system. "To the uninitiated in geology," says Dr Buckland, "rectifications in the distribution of strata on so large a scale may seem calculated to shake confidence in all the conclusions of our science; but a contrary inference will be drawn by those who know that these corrections have never been applied to conclusions established on the sure foundation of organic remains, but to those rocks only of which the arrangement has been founded on the uncertain character of mineral composition."

This controversy had scarcely terminated at the time the second edition of Greenough's geological map was published; but it had resolved itself into a question of nomenclature, both parties being agreed as to the sequence of the series in Devon and Cornwall. Sir H. de la Beche had substantially adopted the divisions of Sedgwick and Murchison, applying, however, to the culm measures, which they placed on the parallel of the true coal measures, the provisional name of *carbonaceous*, calling the fossiliferous slates below them grauwacke. Mr Greenough, adopting from him the term carbonaceous for the culm beds, coloured them as belong-

ing to the coal measures, and applied the name Upper Killas to the Devonian and Silurian systems of Sedgwick and Murchison, that of Lower Killas to the slates inferior to the Silurian, which they termed Cambrian. About the sametime, Mr Griffith applied a similar change to the S.W. portion of his geological map of Ireland, colouring as old red sandstone and carboniferous limestone extensive districts of the counties of Kerry, Cork, and Waterford, to which he had previously assigned a higher antiquity, from the identity in lithological character of the shales and grits of the old red sandstone and carboniferous systems with the older rocks of the transition series.

The old red sandstone had long been considered as a rock principally developed in Britain. By continental geologists it was regarded as the upper part of the slate or grauwacke series. The discovery of it, therefore, in Devonshire, under the continental form, rendered it probable that that was its true character, and that the conglomerates, softer sandstones, and marls of various parts of Britain, were deviations from its ordinary mineral type. To ascertain this point, and to determine whether the principal transition districts of continental Europe exhibited the three groups of Cambrian, Silurian, and Devonian, into which they had divided the British series, Professor Sedgwick and Mr Murchison visited those parts of Belgium and the north of Germany where the slate rocks are exposed. They recognised beds containing Silurian and Devonian fossils, and on the right bank of the Rhine established a perfect sequence of deposits along a frontier of fifty miles in length, from the true coalfield of Westphalia, with carboniferous limestone into Silurian rocks, with an intermediate group containing Devonian fossils. They could find, however, no older fossiliferous group than the Silurian, and declared it to be difficult to define the limits between it and the Devonian.

In order further to test the accuracy of the above threefold division of the Palœozoic rock on a still wider scale, Mr Murchison extended his researches to Russia, and ascertained that Silurian rocks occupy several islands in the Baltic, and large tracts in Livonia and Courland, ranging by St Petersburgh to the N.N.W. On the south he found them concealed by a great red sandstone formation, which had formerly been considered the new red sandstone, from containing rock-salt and gypsum, but which was proved, by its fossil contents, to be the old red, containing fishes of the same species as those which characterise that deposit in the British isles. These Devonian rocks in Russia are surmounted by carboniferous limestone, ranging from Moscow to Archangel and into the country of the Samoides, spread in horizontal [illegible] nearly 10[illegible] miles, and preserv-

ing throughout that area the same lithological characters, which are those of a white incoherent tertiary limestone.

Thus not only was the classification of the Palœozoic strata derived from the English type confirmed, but new proofs were afforded to geologists, if proofs were wanting, of the small value to be attached to mineral characters, in determining the age of strata, in the absence of the test of actual superposition, and the superiority of identification by means of organic remains. Instances had long been known in which the newer, secondary, and even tertiary strata in the vicinity of igneous rocks and centres of disturbance, had been subject to metamorphic action, and had assumed the mineral characters of the older strata, and here we found, that when these older rocks themselves have remained undisturbed over large areas, their structure differs scarcely at all from that of the most recent. We were also strongly impressed with a fact which is daily forcing itself, more and more, upon the attention of geologists, namely, that identification of strata by means of organic remains must not be pushed too far, and that, while certain assemblages of rocks are characterised universally, as far as geological research has yet been carried, by certain large groups of fossils, we must take the general features only as our guide, and must not attempt to identify particular subordinate members of those groups in distant localities by the presence or absence of a few species; because the original mineral condition of a rock exercised a considerable influence in the distribution of the organic remains imbedded in it, or, in other words, the nature of the sediment at the bottom of the sea regulated the nature of its inhabitants. Thus, while slates and limestone, in the north of Russia, contain the same assemblage of shells and corals as the same kind of rocks in Devonshire, together with a few fishes, we find others resuming the mineral characters of the old red sandstone of Scotland, and, with the reappearance of these characters, the fishes characteristic of the British deposit again become abundant. This is only in accordance with existing analogies. We know that in those parts of the existing seas where calcareous springs abound, the sediment is charged with the remains of shell-fish and corals, with a few remains of fishes, while these latter frequent sandy bottoms, and there leave their remains in greater abundance. During the progress of these investigations in Europe the American geologists were not idle, and their researches shewed that nowhere are these older rocks developed on so splendid a scale as on the American continent. Beneath the coalfields of British America and Pennsylvania there is a vast assemblage of fossiliferous strata, in which Mr Lyell, who has lately visited the country, has recognised the Silurian and Devonian characters.

Mr Murchison, in one of his anniversary addresses, when President of the Geological Society, expressed himself in terms of warm admiration respecting the kindly feeling and mutual good will with which the members of that society aid one another, each in that department of science for which he stands pre-eminent; and exulted in having been placed for a time at the head of "a brotherhood united for purposes so great, and knit together by such lofty and enduring sympathies." In this eulogium there is much truth; but it must be confessed, notwithstanding, that there never was a fraternity in which the organs of pugnacity were more strongly developed. No sooner does one of them announce a new fact or conclusion than another steps forth to controvert it—the bye-standers take part in the dispute—the battle becomes general—*saxa et tela volant*—stones are "shied" (to use the phrase of an eminent geologist) in all directions—and hammers are plied without mercy; and thus all the established facts and inferences of geology have been fought out hand to hand and foot to foot. This is the mode in which truth is elicited by the most loving and united brotherhood that ever yet existed; this is the way in which geologists "interrogate nature with a hammer." One advantage results from this state of things, and that is, that the uninitiated may safely rely on those conclusions on which the whole geological body are agreed. There is little danger of a combination among them, for the purpose, as some suppose, of palming an imposture on the world. In the present instance, while the author of the Silurian system was bearing his banner in triumph over the whole of Europe—had even advanced it into Asia—was threatening to plant it on the great wall of China—and appeared likely to have soon to weep, like another Alexander, because there were no more worlds to conquer, he and his fellow-labourer in the arduous task of reducing the Palœozoic rocks to order were called upon to defend the first provinces which they had subdued nearer home. We have seen how, in Devonshire they gained a victory over the Director of the Ordnance Geological Survey, by the establishment of the old red and carboniferous colours over a large area which he would have assigned to rocks of a more ancient date. It was now his turn to have an advantage, and, accordingly, when the Ordnance Geological Staff moved into South Wales, applying exact trigonometrical measurements to the thickness of the strata, following them along their strike, through all their mineral changes, tracing them through all their contortions, and instituting such a minute and active search for organic remains as their numbers rendered easy, they were enabled, not only to reduce considerably the thickness assigned by Mr Murchison to [illegible] sandstone [illegible] spread the Silurian tint over an

extensive region which he had allotted to the rocks of the Cambrian system. This region lies to the north and west of the Towey in Caermarthenshire, and the north of Haverfordwest in Pembrokeshire. Mr Murchison says that he coloured it as Cambrian rather than Silurian, from finding no fossils in it during the few visits which he paid to it, and from its exhibiting the mineral characters of the Cambrian rather than of the Silurian system. These Cambrian strata the Ordnance Geological Surveyors have proved to be nothing more than the very same lower Silurian rocks, Caradoc sandstone, and Llandeilo flags, which Mr Murchison had worked out on the east and south, repeated in great folds and undulations, often parting with their calcareous matter, assuming a slaty cleavage, and, in some parts, highly altered by the intermixture of igneous rocks. In like manner, Mr Bowman, in Denbighshire, and Mr Marshall and Mr Sharpe, in Westmoreland, had shewn that rocks previously classed as upper Cambrian were upper and lower Silurian. In the continental researches of Professor Sedgwick and Mr Murchison, they had found that wherever a fossiliferous zone of slate rocks existed, shells of the genus orthis, which characterised the lower Silurian rocks, were the earliest types of organic life. It became evident, therefore, not only that the upper Cambrian group must be abolished, but that, notwithstanding the vast thickness of strata in North Wales, below the Llandeilo flags, they contained no fossils different from those of the *lower* Silurian, so that, zoologically considered, it is identical with the whole of the Cambrian series. Mr Phillips, who is employed by the government to describe the organic remains collected in the Ordnance Geological Survey, even ventured, in his work on the fossils of Devonshire, to adopt an arrangement and nomenclature from which the term Silurian system was wholly obliterated. Under the name of Palœozoic system he comprised the whole fossiliferous series to the magnesian limestone inclusive, dividing it into three groups, called Upper, Middle, and Lower Palœozoic; the upper containing the carboniferous deposit and magnesian limestone; the middle comprising the Devonian and upper Silurian systems; and the lower, to which he also gave the name of Protozoic, included the Cambrian and lower Silurian. To such an arrangement we shall see, presently, that Professor Sedgwick has no objection, though Mr Murchison, in his last address as President of the Geological Society, has protested warmly against the suppression of his "Silurian system."

Not satisfied with the zoological identity established between the lower Silurian and the Cambrian groups, some geologists were inclined even to deny the existence of fossiliferous strata, in North Wales, below the base of the Llandeilo flags, and in-

timated that the fossils found in a few localities in the counties of Caernarvon and Merioneth, were but reduplications of that rock such as the Ordnance Surveyors had detected in Caermarthenshire. Professor Sedgwick, therefore, devoted portions of three summers to the re-examination of the districts in which his study of these rocks first commenced. The result, which has been recently communicated to the Geological Society, is the reassertion of his former views, as far as regards the existence of a suite of rocks of great thickness, occasionally fossiliferous, much lower in the series than the Llandeilo flags; the admission—not made, however, now for the first time—that the lower Silurian and Cambrian rocks constitute one zoological group, and the removal of the fossiliferous slates above the Bala limestone, previously classed as upper Cambrian, to the upper Silurian group.

The existence of a vast thickness of strata, locally fossiliferous, below the Bala limestone, is proved by several ascending sections; the two most remarkable of which are situated at Llanberris, and east of the great anticlinal of Merionethshire, which ranges from about three miles east of Ffestiniog to the coast a little south of Barmouth. At Llanberris, and in the parallel section exhibited in the gorge of Nant Francon, there is a regular ascending series, above the roofing-slate quarries of Colonel Pennant and Mr Asheton Smith, continued through a horizontal distance of three miles, and intersecting beds, without a single flexure, inclined more than 50 degrees. In this great mass of strata no fossils have been detected; but at its top appear fossil bands, containing several species of shells in great abundance, together with corals and stems of encrinites. These bands range on the east side of the highest summits of the chain from Moel Hebog, through Snowdon, to Carnedd Llewelyn. The country east of that range, Professor Sedgwick says, might be represented by a peculiar colour; but he is unwilling to separate it from the series below, on the negative evidence of the absence of organic remains from the lower rocks, which may be upset by further observations.

After two rapid undulations, there is again a great ascending section to Cape Curig, and thence over the shoulder of Moel Siabod to the bottom of the valley near Dolwyddelan. This ascending section (interrupted only by one very short undulation) measures five miles on a horizontal base, at right angles, to the strike or direction of the beds. The thickness of the fossiliferous part of the series must, therefore, be enormous. In the hills east of Penmachno, and south of Bettwsy Coed, are calcareous beds, in some places burnt for lime, with more numerous fossils, which he places somewhat higher in the series, and considers the equivalent of the Bala limestone, though rather on general analogy than on any direct evidence of sections. Again, from the great

Merionethshire anticlinal above described to the Bala limestone here is a great ascending section, on two or three parts of which are found organic remains, far below the parallel of that limestone; and above the Bala limestone, to the crest of the southern Berwyns, is a series of beds, some of which contain many lower Silurian fossils, and, at least, one more calcareous band. With the Llanberris and Nant Francon sections I had long been familiar. They were pointed out to me, when resident in that part of Wales, in 1829, by Professor Sedgwick, who then explained to me the structure of the country, in which I had previously been able to discover nothing but a mass of confusion. The district lying eastward of the Merionethshire anticlinal I knew less about, having only occasionally visited it, until the autumn of last year, when, having been engaged on the survey of a line of railway between Newtown and Porthdynllaen, I was instructed to report to the engineer who had the direction of the survey on the geological structure of the line. Having but little time allowed me for this purpose, and being obliged to confine my explorations very closely to the course of the projected railway, I was led, from the great succession of rocks with the same eastern dip, between the great Merionethshire anticlinal and the valley of the Dyfi, indicating such a vast thickness of deposit, to fear that I must have missed some intermediate anticlinal ridge, and was about to write to Professor Sedgwick to ask for information on this point, when, on going, on my arrival in London, to the rooms of the Geological Society, I found diagrams of parallel and nearly adjoining sections to that which I had been exploring, suspended in the meeting-room in illustration of a paper just read by Professor Sedgwick on the subject, and these fully confirmed my independent observations.

The fossiliferous series of Wales, above described, Professor Sedgwick calls the great Protozoic group. He does not consider that there is good fossil evidence for its separation into distinct formations. Its inferior beds, though far below the Caradoc sandstone and Llandeilo flags, of which some geologists were disposed to regard it as a reduplication, contain comparatively few species undescribed in Mr Murchison's Silurian system. It is, therefore, he says, neither *Cambrian* nor *Silurian* in the limited sense in which those terms were first used, but *represents both systems, inseparable as they are in nature.*

The fossils of the upper portions of the Welsh series, in the neighbourhood of Abergele, Llanfair, Talhaiarn, Bronheilog mines, Llanrwst, Llangollen, and Dinas Bran, agree very nearly with the fossils figured by Mr Murchison, from the Wenlock shale to the tilestones at the base of the old red sandstone inclusive. They are, therefore, upper Silurian; but the mineral structure of the

rocks being almost entirely different from that of the upper system of Siluria, the distribution of species is also different, so that they are incapable of being arranged into distinct groups, marking the successive steps of an ascending or descending section so as to agree with the subdivisions of Mr Murchison. It is the same with this part of the series in Westmoreland. Out of ninety species of upper Silurian fossils from that district, nine-tenths agree specifically with those described by Mr Murchison as occurring in the Silurian rocks of Shropshire and the Welsh border; but their arrangement in the actual sections admits of no rigid comparison with the subordinate groups of that locality. Neither can any such minute accordance be established between the continental rocks of this age and the subdivisions of Siluria.

The following are the general conclusions which Professor Sedgwick draws from the preceding facts, and the following is his classification of the British Palœozoic strata founded on them. They are considered, zoologically, as forming one great system, separable into four primary divisions:—

I. The CARBONIFEROUS, subdivided into four principal groups in the descending order, viz.:—

a—*Magnesian Limestone*, and lower part of the new red sandstone, zechstein, and roth-tod-liegende. In this group are the drifted coal plants of the lower red sandstone of England and the coal-beds of the Harz associated with roth-tod-liegende.

b—*Great Coal Formation* of England, Scotland, Belgium, and Westphalia, consisting of freshwater beds, and many beds of plants not far drifted, sometimes unmoved from the spots where they grew.

c—*Millstone Grit, Shale, and Limestone*, &c., with drifted plants, and beds of coal; great scar limestone of the north of England; culm measures of Devon; (?) great coalfield of the west of Ireland.

d—*Lower Limestone and Limestone Shale*, &c., imperfectly represented in England, but probably here and there replaced by the conglomerates at the top of the old red sandstone; lower limestone and carboniferous slates of Ireland; lower coal formation of Scotland. In this group are placed a part of the beds of North Devon under the culm measures, and containing fossils like those of the carboniferous slates of Ireland.

II. DEVONIAN OR OLD RED SANDSTONE GROUP. In this division are placed the older fossiliferous slates of Devon and Cornwall; the beds below the carboniferous limestone of Belgium and Westphalia, as far as the Eifel, and great Westphalian lime-

stones inclusive; all the old red fish-beds of Scotland; all the central part of the old red sandstone series of Herefordshire; old red sandstone, &c., of Ireland.

III. Upper Silurian rocks of Mr Murchison, from the Wenlock shale to the lower part of the tilestone inclusive; the Denbigh flagstones; upper division of the fossiliferous slates of Westmoreland and Lancashire; many portions of the fossiliferous rocks of ths Flemish provinces, and various parts of France; some small fossiliferous groups in the south of Scotland; and parts of the fossiliferous series in the south and north of Ireland.

IV. Great Protozoic Group. All the older fossiliferous slates of North and South Wales; Coniston limestone; lower part of the Silurian system of Mr Murchison; oldest fossiliferous slates of Scotland and Ireland; and of various parts of the Continent.

Between these great primary divisions of the Palœozoic system, Professor Sedgwick states that it is very difficult to draw clear and consistent lines of demarcation. They pass into one another, and interchange some fossil species, particularly near their limits. Were it not for the magnificent sections of the old red sandstone in the British isles, and also in the north-eastern parts of Europe, now shewn by Mr Murchison and his associates, he considers that the second and third divisions would probably be confounded, and eventually pass under one common name, including upper Silurian and Devonian. In Belgium and the Rhenish provinces the demarcation between them is quite arbitrary; long-winged spirifers, and other organic types, first supposed to be characteristic of the Devonian rocks, are there abundant in Silurian strata, and there is nothing in the physical structure of those countries to suggest the separation of these two divisions. By the help, however, of the British sections, combined with new facts brought to light in Russia and America, the second division must maintain its place. Between the third and fourth divisions (Cambrian and upper Silurian) it is stated by Professor Sedgwick that there is a much better marked separation, both physically and geologically, than between the others. These two divisions, at least in North Wales, differ in structure, interchange hardly any fossil species, and through large districts are unconformable. Hence they belong to two *systems* and not *one*, if the word *system* is to be used in a definite sense, and applied to the successive divisions, as the Devonian, &c. To avoid incongruity of language, therefore, he uses the word *system* in a general sense, and under the name Palœozoic system describes the whole series of formations comprehended in the four divisions above described. In the great descending series, the "Silurian system," in the sense

in which the words were first used, stands in the place of the third and upper part of the fourth primary division.

Such are the results of the investigations which have been carried on during the last fifteen years, in order to establish a zoological classification of this great group of rocks; and such are Professor Sedgwick's matured views, which it will be seen accord with those put forth by Mr Phillips in his description of the Devonian fossils, except that the former admits, though with some hesitation, a fourfold instead of a threefold division of the Palœozoic system.

If we continue the use of the terms Silurian and Cambrian systems in the limited sense in which they were first employed, it is evident that one of them is superfluous; and it appears to be a very general feeling among geologists, in order to preserve both, to restrict the term Silurian to the strata above the Caradoc sandstone, that is, to the upper Silurian rocks of Mr Murchison, and to include the lower Silurians in the Cambrian system.

The ground being now cleared by the establishment of the above classification of the Palœozoic system on the sure basis of organic remains, we shall be better prepared on a future occasion to enter on the consideration of the agricultural characters and geographical distribution of these rocks through the British islands. Want of space prevents my giving, as I had intended, a general description of the curious and interesting assemblage of fossils which characterise this ancient group of rocks; and, perhaps, it will be better reserved to be connected with an account of those other great groups which are peculiar to the oolitic and cretaceous and the tertiary rocks—the Mezozoic and Kainozoic systems of Phillips.

ON PUERPERAL FEVER IN THE COW.*

By Mr John Barlow, V. S. Oak Farm, Wilmslow, Cheshire.

There was a time when the practice of veterinary medicine was confined almost exclusively to men who considered an attainment of scientific information in no way conducive to its successful pursuit, but by whom the possession of a little mechanical tact, and of a few recipes, composed frequently of inert or ineffectual ingredients, were deemed sufficient passports to practice.

This state of things we now observe to decline rapidly, and veterinary surgeons, instead of receiving as unexceptionable opinions and dogmas of their predecessors, adopt such only so far

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* Read before the Edinburgh Veterinary Medical Society in the session of 1843-4.

as consistent with the present state of knowledge on anatomy, physiology, and pathology—sciences the more intimate acquaintance with which will prove our surest guides in any application of surgical or therapeutical remedies.

Yet, even still we have occasionally to witness the truth, that ignorance obscures a dawn of brighter days, and operates in a manner highly injurious to the full application of correct principles, when at variance with popularly-received opinions in themselves erroneous.

This, when applied to our profession, is most evident in that department relating to the diseases of horned cattle, and it is not until we are practically able to shew the public our full qualification and superior ability to treat this class of patients, in comparison with the cow-leech or farrier, that we shall receive those tokens of confidence whereof we may suppose ourselves deserving.

Although some of you may not expect, or intend, in your future professional course, to practise much in this department, yet there are others of whose avocations it must necessarily form a large part, and who are fully sensible of its importance; whilst there can scarcely be any so far exempt from the uncertainty of occasional attendance on cattle, as to justify a systematic neglect of this branch of study during the time afforded for an attainment of veterinary knowledge.

In hope of myself reaping some advantage from the discussion on this essay, and willing to join in the noble object contemplated by this society—namely, a diffusion of veterinary knowledge—are motives which have induced me to appear before you, regretting, nevertheless, none abler than myself has undertaken the subject, confessedly one of the most abstruse, yet one of the most interesting, on veterinary record; for there are few or no diseases affecting any class of our patients which, for suddenness of attack, rapidity of termination, or peculiarity of symptoms, can be compared with what is called puerperal fever in the cow.

It is a disease occurring from within a few hours to three days of calving, involving speedily an abolition of motion, sensation, and special sense, ultimately a cessation of the true spinal and ganglionic functions—all these, nevertheless, denoted by few or, indeed, no very evident premonitory symptoms.

Previously to entering upon the immediate subject of the essay, I hope to be indulged in a few observations relative to the name of this disease, as I consider it improperly descriptive of those symptoms whereto it is usually applied.

What is commonly termed puerperal fever, I, along with many others of the profession, consider to be an affection of the nervous system, and not, as in the human subject, to consist primarily of peritoneal inflammation. Still, I am free to acknowledge that

peritoneal and uterine inflammation do occur in the cow, and that the appellation, if limited to such only, would be proper. But why apply it, as is continually done, to inflammation, not only of those parts, but to that of the brain, lungs, bowels, &c., merely because occurring near calving?

There is also another affection to which cows are liable at this time, bearing in its symptoms considerable similarity to the disease we are about to consider, yet totally different in pathology, still it also is almost invariably called puerperal fever.

It consists merely in inability to rise, or to properly use the hind extremities, depending generally upon weakness of the system. It is accompanied with little fever, no coma, or other symptom of cerebral disorder. These cases mostly recover under good nursing, external and internal stimulants, aperient aromatics, &c.

This indiscriminate classification of many diseases, occurring soon after calving, under the general term puerperal fever, has given rise to endless discrepancy of statement, both with respect to treatment and *post mortem* appearances; one stating there is inflammation of the bowels, uterus, lungs, &c.; another finds these viscera healthy, and detects morbid appearances in the brain, or some other part of the nervous system alone. Again, we find one practitioner combating the disease with stimulants, whilst another advises powerful depletive measures.

Now, although, as just stated, various diseases, common also to other occasions, may occur after calving, each presenting symptoms characteristic of its nature and seat, yet one of the most frequent is an affection occurring only at this particular juncture, which, although likewise called puerperal fever, I consider to exist in the nervous system, and, in support of this view, shall endeavour to account for its several symptoms upon recognised physiological and pathological conditions; still, being myself unprepared to substitute any other name, I shall be compelled to adopt it under these qualifications.

As before noticed, the symptoms are suddenly developed, and decisive in character, occurring within three days of calving, often within twenty-four hours of that process, as immediately on the establishment of reaction, after collapse, which, to a greater or less extent, according to constitutional peculiarities, accompanies ordinary cases of parturition.

In some cases of puerperal fever, all symptoms, constituting various phases of the disease, have been developed within six hours of their earliest appearance.

The first grounds for apprehension arise from less quantity of milk being yielded than natural, from an evident impairment of appetite, with a stronger, though not much more accelerated, pulse than usual after calving.

The conjunctival and vaginal membranes are injected. Horns and mouth hot, with a glistening appearance in the eyes.

Such slight deviation from health can scarcely be called actual disease—in fact, can hardly be detected as a state exceeding in character the usual stage of reaction, and almost invariably eludes the vigilance of those in ordinary attendance upon cattle, whom experience has not qualified with more than usual discrimination, as it merely consists in a febrile state of system, always short, immediately preceding the establishment of disease, soon to be manifested by unequivocal symptoms.

The cow presently entirely refuses meat, respires more quickly, the pulse, however, seldom rises above sixty, but is full, sometimes oppressed; there is little milk secreted, and scanty evacuations. We may sometimes observe a few impatient tosses of the head—madness—and a peculiar expression of distress always is present. But the symptoms now more directly intimating the forthcoming disease are a remarkable change in the eyes, which have assumed a light leaden hue, and involuntary swerving motion of body, and constant shifting of the feet to preserve its proper balance; indeed the beast will frequently support herself against the stall.

The cow-herd, now fancying something wrong, informs his master, who takes probably a few pints of blood, and administers some favourite drench. These means, however, seldom produce any other effect than that of delaying the assistance of a practitioner, till any remedies he may apply, however judiciously directed, will, by the delay, be rendered completely ineffectual.

He, perhaps, having had some distance to travel, on arriving, finds every symptom increased in severity. The cow has fallen, and is comatose, with head turned upon the side, or prostrate, from inability in the cervical muscles to support it; the rumen is distended, causing deep groans during respiration; the powers of motion and sensation are diminishing; the ears hang pendulous; there is imperfect or total insensibility of light applied to the eye, or of stimulus to the eyelids; power of deglutition, if not entirely abolished, is much impaired; there are no evacuations; an intermitting pulse, with cold extremities, stertorous breathing, and unconcious dashing about of the head.

The intensity of these symptoms increases. On raising the head, the lower jaw hangs pendulous; should any liquid be administered, from an absence of sensation and motor power in the pharynx and larynx, the fluid passes directly into the trachea, occasioning spasm, sometimes death; the pulse acquires a feeble stroke, but increases in quickness; breathing, from accumulating mucus, more and more stertorous; the pupil is contracted; the sphincters lose their full power; and, should the head be lower than the body, food will return from the stomach

involuntarily, occasioning an intolerable stench. Such state having supervened, I never knew a cow recover.

These symptoms are, as may naturally be supposed, more intense in some cases than others, necessarily influencing their duration. Sometimes, after falling, the cow will struggle violently, endeavouring to rise, which she will sometimes accomplish. I always regard this favourably in prognosis. Death may occur in six, eight, or twelve hours; sometimes the animal lives twenty-four or thirty-six hours, or more.

A notice of causes inducing this disease involves many important considerations; due attention whereto I conceive necessary, properly to account for the morbid phenomena exhibited.

The cow, of all other animals, is destined to afford the largest amount of that wholesome and nutritious beverage, milk. A constant supply of this fluid is a considerable demand upon the constitution in certain states, only in some of which it is yielded largely: these are, in an unimpregnated condition of uterus, and during the earlier months of uterine gestation. A cow may, by preserving the former of these conditions, continue yielding milk for years; but, during the latter months of gestation, its secretion sensibly diminishes, and, for some weeks previous to parturition, it is ordinarily entirely suspended. We all know that a large supply of milk and an advanced state of gestation are incompatible. With reference to the relation existing between the quantity of milk yielded and period of gestation, it may be stated that, in an average of cases, by the fifth month of conception, a diminution of one-third its quantity has taken place—by the sixth month, two-thirds—and soon after the seventh, it is usually entirely suspended.

In what other way can we account for this than by supposing that now the fœtus exercises for its developement a demand upon the organic functions equivalent to the quantity of milk which would otherwise have been yielded; requiring, as it does, in common with that secretion, a large quantity of circulating fluid for its formation.

Fully to provide for fœtal growth, there is, in mammalia, during gestation, a greatly increased, and, the nearer parturition, a rapidly increasing, developement of vascular system in the parent; but, perhaps, in no animal does this correspond in extent with that of the cow, which may be accounted for by the fact that Providence has destined her, not only amply to provide support to her offspring, but also to contribute largely towards that of mankind. Hence her peculiar liability to various diseases, both in a puerperal and barren state, arising from an existence of a larger quantity of blood in the system than is immediately necessary for growth and nutrition.

In making these remarks, my intention is to render obvious, that, shortly previous to, and at the time of, parturition, there is, from the requirement of increased activity both in the animal and organic functions, an increased stimulus or action required to be exercised by the nervous centres effectually to promote their performance.

It has been ascertained by Dr R. Lee of London, that, during conception, not nerves only, but considerable ganglia, previously not perceived to exist, are apparent in the vicinity of the uterus.

Such stimuli, of a nature and duration unknown on any other occasion, must therefore be favourable to a developement of disease, by rendering the nervous system susceptible of impressions which, under other circumstances, might not have operated thereon.

This extremely vascular state of system is, in ordinary cases, relieved by a plentiful secretion of milk, which nature, as it were providing against consequences, excites the udder to secrete some time prior to parturition. In other cases it is different; and we are all perfectly aware of the physiological truth, that any organ, ceasing to perform its usual actions in the animal frame, cannot suddenly resume them—in fact, we know that, if such be suspended for any undue time, they are incapable of being again re-exercised.

Although this may apply less to the udder than any other organ of the body, still it must be confessed at times to fall within the general application of this principle, and not after all cases of parturition to regain its former activity.

Parturition, by separating the fœtus and its membranes from the maternal uterus, involves a sudden and complete check to the current of blood recently required by it in utero, being now provided with means of sustaining an independent life, dependant, nevertheless, still on its parent for food—namely, milk, and that milk secreted from the circulating fluid, previously imparting nutrition in another form and through another channel.

Should, then, any constitutional or other cause interfere, so as to prevent a secretion of milk, in full proportion to an existence of its elements in the system, or this effect be produced by any tardiness of the udder in resuming its functions, we can easily conceive that, under such circumstances, some organ, or class of organs, previously wrought upon by unusual stimulus, would, from the consequent predisposition thereto, assume a diseased action. Again, in other cases, the udder may perform, to the full extent of which it is capable, all its natural functions, and still, so far, inefficiently counteract this sanguineous state of system as to permit an existence of the same condition.

Thus, I infer, arises one great, if not the greatest, cause induc-

ing puerperal fever; and that the nervous centres are at this time more than any other susceptible of morbid impressions, we have, in my opinion, from these collateral considerations, a right to infer; indeed, so far admitted is this, that many practitioners are of opinion that the cow is, during her later period of gestation, in a constant state of excitement or slight sympathetic fever.

It will then be evident that cows yielding large quantities of milk, and kept on stimulating food before calving, must be extremely liable to this disease. Of this we have daily evidence in its frequent occurrence among farmers or dairy keepers whose interest or pride it is to create as much milk as stimulating food will produce; and of its comparatively rare occurrence among others who habitually, either from neglect or poverty, keep their cows lean. It is, indeed, proverbial, in some districts, that fat cows, if good milkers, are pretty certain to fall of "milk fever," a name, among professional men, now in disuse, but one, like many others, arising from observation, and certainly more proper than the one we adopt.

A fat state of body alone is, by many, considered a cause of this disease, shewing, as it does, the materials and processes of assimilation to counterbalance the expenditure of vital power, a state certainly favourable to disease of various kinds. I have, however, uniformly observed, that here puerperal fever, in the character we are now considering it, seldom makes its appearance unless the vascular and, consequently, the lacteal systems are fully developed—a state not always in unison with the former.

In no one instance do I remember to have seen it occur in a bad milker, however fat, as in these comparatively non-vascular constitutions, there is not a sufficient quantity of blood to throw back upon the constitution which can operate injuriously. It is also worthy of remark, as tending still further to confirm this view, that such description of cows have uniformly small calves, while those of an opposite constitution, although lean, have generally large ones.

The disease never occurs at the first or second calving, should it take place at or before four years of age, very rarely, indeed, at the third, not often at the fourth, if these take place before five years old; it frequently occurs at the fifth, and the liability in predisposing constitutions increases with each successive parturition. The cause of its non-appearance in early life is due to the fact that, at this time, the system has not arrived at its full degree of growth and consolidation, which processes being consecutive with gestation, and of considerably more active character in the young than adult animal, there are, of necessity, greater demands or adaptations for an accumulating quantity of blood ... maturer age to accomplish those indispensable processes

of growth and developement, thereby preventing the possibility of its injurious determination to one organ or tissue exclusively.

The disease never follows abortion, which we can easily account for, on the ground of its non-appearance in bad milkers.

There is a pretty certain preventive in milking the cow some time before calving—in full blood-letting before or immediately after—in purgatives—very limited diet—and in other depletive measures, each and all tending to illustrate the necessity of a vascular state of system for its developement.

Some eminent veterinary surgeons consider that constipation is more frequently than any other, or, indeed, is exclusively the cause; and in support of this view urge the apparently well-founded argument that, so soon as purgation can be established, the cow recovers. Although myself willing to admit constipation may be occasionally a cause, and that at all times it much aggravates the disease, I shall presently endeavour to prove it is far oftener the infallible effect, depending upon a peculiar state induced by the disease, and devoid of those symptoms which would characterise it if a primary cause. I have indeed seen many cases wherein a hardened state of faeces never existed; but torpidity of the bowels, or suspension of their usual action, always is present.

Very rarely does it occur after protracted cases of parturition, these requiring a considerable expenditure of muscular energy, and, consequently, a large determination of blood to that tissue may thus prove cases of exemption. It likewise very rarely follows flooding from the uterus.

I may again observe that these several states, considered as possessing immunity from this disease peculiarly, are still liable to various others, to which their idiosyncrasy predisposes, exhibiting symptoms totally different to those we have considered, and presenting *post mortem* appearances equally varied from those we are about to detail.

The predisposing causes, then, we may consider to be the existence of a larger quantity of circulating fluid in the system at the time of parturition, produced constitutionally or artificially, than is required for the animal and organic functions.

An excitability of nervous system induced by gestation and parturition unknown at any other time.

Anything indirectly preventing a full secretion of milk, or this directly produced by inability, inactivity, or want of tone in the udder itself to resume its functions, thus causing

A want of lacteal secretion in proportion to an existence of its elements in the system.

The adult or full state of growth, with considerable developement of the vascular system and plethora, or,

A great developement of vascular system alone. Constipation may be a cause.

The exciting cause is parturition. These causes may, however, be considered to possess such a reciprocal influence at the time of parturition as to promote the disease through their conjoined operation.

Morbid *post mortem* appearances in this disease I have in many minute examinations found to exist in the nervous system only of sufficient extent to cause death, or to occasion, during life, symptoms such as we have recently noticed, and frequently, under these examinations, the manifestations are of such a character as almost to elude detection, which is alone satisfactorily effected by frequent and careful comparative dissections of the nervous centres in this with other diseases, and these again with the healthy state.

Although cows frequently die after calving, denoting during life, and upon examination after death, disease both of the nervous and respiratory, or nervous and digestive, or generative systems, as the case may be, such being evidently cases of combined affection, claim no place in the present consideration, which is limited to pure puerperal fever alone.

We then proceed, and, on examining the abdominal viscera, find in them structurally, except occasionally organic chronic disease, no deviation from what is considered a healthy appearance.

I have repeatedly traced the intestinal canal from abomasum to rectum, without finding, externally or internally, a single point of inflammatory or other morbid surface. The large intestines often contain hard excrement. The stomachs present structurally a healthy appearance, but the contents of the third are mostly hard. This hardness of food and faeces is by no means always present, and holds at all times a close relation to the duration of disease.

The uterus is large or small according to the period elapsed since parturition; if a day or two have passed, it will be well contracted, provided the placenta be expelled, which is not always the case.

Its mucous coat and muscular tissue under the former state exhibit no greater amount of vascularity than usual on those occasions.

The bladder is mostly full, provided no evacuation has been effected mechanically, or at death, during the general relaxation of all sphincters.

I have on one or two occasions seen an inflammatory blush exist on the mucous surface of the bladder, and also extended slightly to its peritoneal covering; but in these the organ was much distended

The liver is usually congested, and gall-bladder large.

In the thoracic cavity there is also an absence of actual disease. The lungs are in most cases congested, which is caused by the right ventricle of the heart continuing to force blood therein, when, from an impaired state of respiratory action, they are incapable of fitting its return into the systemic circulation.

Now, the presence, during life, of symptoms previously detailed, and doubt not you have witnessed, together with an absence under *post mortem* examinations of actual abdominal or thoracic disease, induced Mr Friend of Walsall, some years ago, to suppose this affection existed in the nervous system. Since that period his opinion as to its seat has obtained support from many practitioners; and I am inclined to suppose the opposition thereto of others has arisen, as before stated, from a too indiscriminate classification of other diseases occurring near parturition, under the common appellation of puerperal fever.

Being, then, well acquainted with healthy appearances and anatomy of the nervous system on other occasions, we should in these cases proceed carefully and immediately after death to their examination; for, if long delayed, there are various processes taking place sufficient to render our judgment and investigation fallacious, as increase in sub-arachnoidean fluid, and softening of central substance. The cerebral and spinal centres should be exposed, together with their membranes, if possible, without any laceration of either.

We sometimes find considerable injection of the dura mater enveloping both brain and spinal cord; this, however, is not invariable, and is always greatest under considerable pulmonary congestion.

I never saw any morbid appearance in the arachnoid membrane itself. It is somewhat difficult of demonstration in the cow, except upon the convexity of each hemisphere. There exists, however, almost uniformly, an evident increase of sub-arachnoid, cerebral, and spinal fluid.

Having detached these, we come to the pia mater, a membrane almost invariably exhibiting either intense congestion or inflammatory action. The minute blood-vessels ramifying its substance may, on slicing the cerebrum, be perceived to impart at times a diffused blush to the centrum ovale. This appearance is evident also in the spinal marrow, more especially at its lumbar portion.

On opening the cerebral ventricles, we find, if the case has been severe, considerable effusion of serum therein, with intense congestion of the choroid plexus, velum-interpositum, and cerebellar choroid plexus. Sometimes there have been clots of blood discovered in the brain at its under surface, and within the spine also. In both spinal and cerebral substances there are frequently

complete structural derangements, consisting in uniform softening of their tissues, some parts assuming an appearance of homogeneous red paste. In a specimen of this disease, presented to the London Veterinary Medical Society, some years since, by Mr Robinson, V.S., of Tamworth, there was, in addition to such appearances as we have noticed, echymosis of the large nerves, as sciatic and sympathetic.

There is also another morbid appearance often present which does not appear to have attracted much notice—namely, swelling of the brain from congestion of its substance, thereby rendering compression within the bony case equally effectual in destroying nervous power as effusion itself. This is evident, as, on removing the investing bone, its cortical substance immediately elevates its enveloping membranes above their previous boundary.

We now propose to make a few observations on the pathology of this disease in connexion with its symptoms and *post mortem* appearances, as I can say little more by way of evidence to prove its existence in the nervous centres, or that it essentially consists in congestion of that structure, and, in many cases, of speedy effusion into its tissue, causing, by complete disorganization thereof, a consequent inability to perform or preserve its functions in the animal frame.

We have, in vertebrate animals, three kinds of nervous centres, which, according to Dr Marshall Hall's celebrated investigations, are the cerebral, true spinal, and ganglionic. These, although presiding over distinct functions, bear, nevertheless, such mutual dependance upon each other, and relation to the animal frame, that perfect action in all is essential to a healthy maintenance of life.

Although I doubt not your perfect acquaintance with the physiology of each, I will briefly recapitulate them, as it may explain more clearly the view I take of the disease in question.

The cerebral is that division comprising every part of the nervous system relative to sensation, volition, and special sense. Its centre is the cerebrum and cerebellum, to which nerves of sensation proceed from the organs of special sense, external surface, and other sensitive parts, and from which proceed voluntary nerves, pursuing a similar but retrograde direction, forming in the spinal cord its anterior columns, as those of sensation form its posterior. When the cerebrum is irritated, delirium ensues, when compressed, coma supervenes, when lacerated, paralysis occurs. Should other symptoms than these exist, in conjunction with encephalic disease, they arise from an extension thereof to the true spinal or ganglionic systems.

The true spinal division of Dr M. Hall, including the respira- [illegible] S[illegible] Bell is that presiding over ingestion, retention,

expulsion, or exclusion from the animal frame, being functions upon which immediate preservation of life and perpetuation of species are dependant. The centre of this system is the medulla oblongata and medulla spinalis.

According to the same eminent authority, the ganglionic is that division regulating and presiding over interstitial absorption, reabsorption, and the secretion of atoms and particles whereof the animal frame is composed, and of ingesta and egesta.

We have observed that the first unequivocal symptoms of this disease are coma, impairment of voluntary motion, and sensation, with a peculiar appearance in the eyes, somewhat resembling amaurosis. I need not tell you that coma, impairment of voluntary motion, and sensation, present indubitable evidence of cerebral affection, inasmuch as exemption therefrom, except during sleep, which is repose of the cerebral system only, implies a healthy state of brain. These symptoms are all occasioned by pressure upon or within the cerebral substance, in the present case by congestion or effusion, but also exemplified, as previously noticed, by experiments to the same effect.

As the disease advances, we have noticed other symptoms; impairment of deglutition and respiration, inability to move the orbicularis palpibrarum on stimulus. In very severe cases, and near the close of all, we have relaxation of the sphincters and cardiac orifice—these consist in impairment of the true spinal system, by extension of disease to its centres—medulla oblongata and medulla spinalis. In explanation, I may observe that volition, or will to perform motion, exercises considerable influence over respiration; this, nevertheless, can, as a true spinal act, be continued independently thereof, as during sleep, which, as just stated, affects only the cerebrum; but we have in this state, especially during deep sleep, stertorous breathing, a condition in one respect analogous to the affection we are considering, but in this instance cerebral influence is inoperative from disease.

Deglutition is a reflex action chiefly effected by the pharyngeal and œsophageal branches of the parvagum, which, having its centre of nervous power in the medulla oblongata, will also be impaired from similar causes as respiration. It has been ascertained by experiment that the brain may be carefully removed in some animals, yet, by preserving entire the central and peripheral connexions of the parvagum, that respiration and power of deglutition remain. Such respiration, however, is imperfect, and in absence of co-operation with other parts of the respiratory system, insufficient for aerating blood requisite to sustain life any great length of time. Anencephalous fœtuses furnish another example of this phenomenon.

We now take a glance at the ganglionic, or that division of nervous system connected with nutrition and secretion, which is also supposed to regulate the action of internal muscular organs, as heart, arteries, intestines, &c.—a function certainly different to any exercised by the others, yet intimately connected, both anatomically and physiologically with both.

Causes we daily see in the human being applied to either cerebral or true spinal systems affect the ganglionic: witness mental emotions on digestion, biliary, lacteal secretion, &c. And why should not the powerful excitement of parturition in some similar way affect the cow, producing, among the other derangements, arrestment of lacteal secretion?—an event, by whatsoever means effected, directly or indirectly, eminently mischievous. If, then, the centres with which this system is so intimately connected, and upon which it is in some measure dependant, be by any cause incapacitated from performing their functions, what can be anticipated but first a perverted action, and ultimately an entire cessation of its own?

Hence, I conceive, arises that torpidity of bowels and stomachs, cessation of secretion and excretion, constituting the obstinate constipation complained of by practitioners; a removal whereof, may indeed be said truly, is the first step towards recovery, indicating, as that removal does, a return of function to the diseased centres, or, in so far as the ganglionic is concerned, a renewal of mutual relation existing between the organs and materials for secretion.

Now if constipation were the sole cause of this disease, why should its symptoms be so totally different now from those ordinarily accompanying it. Inflammation of lungs or bowels, for instance, exhibits no peculiar variation in symptoms, whether occurring at parturition or other times, and why should constipation? Constipation, as such, will not kill a beast in six, eight, or twelve hours, as this disease frequently does; nor is it accompanied by coma, loss of sight, sensation, and volition, or impairment of respiration and deglutition, but exhibits symptoms of its own with which you are all conversant. This constipation I am persuaded is not exclusively a cause, but almost invariably an effect, depending upon the withdrawal or annihilation of nervous power, from causes already stated whereon healthy organic actions depend. Hardness of faeces and food in the stomachs is occasioned by an operation of physical and chemical changes ever attendant upon the cessation of those of vitality.

That the disease, then, consists in an oppression of nervous tissue is, I conceive, abundantly evident from *post mortem* appearances and experiments, fulfilling the same purpose or effect, [illegible] which they consist. That this oppressing substance consists

in blood, or some of its constituent parts, is also evident upon examination, and is further confirmed by the fact that powerful depletion before calving, or immediately after, prevents the disease. From the fact, also, that it never occurs before calving, and almost invariably within three days afterwards, we may suppose that parturition is the exciting and essential cause of its occurrence.

Our prognosis depends upon the symptoms and stage of attendance. If the animal has only lately fallen, the coma slight, volition little impaired, bowels moderately open, with power of deglutition remaining, we may indulge the hope of a favourable termination. Should our patient, as is too rarely the case, be standing, every probability of success is greater. But if coma is complete, vision entirely gone, respiration and deglutition impaired, sensation and motion destroyed, our prospects can be no other than the reverse. Danger is, indeed, proportionate to what extent the cerebral, true spinal, and ganglionic functions are affected, all being accurately denoted by symptoms for which the practitioner should, by his physiological knowledge, be able to account.

The terminations are, recovery, paralysis of some part or parts, and death. Recovery is often astonishingly rapid, and results from a restoration of parts affected to their normal state. Death is occasioned, not only by breach or oppression of nervous structure, but also by the circulation of blood containing ingredients destructive to life or insufficient to support it, ordinarily separated therefrom by various glands of the body now incapacitated by a withdrawal of their nervous powers upon which their healthy functions materially depend.

In some districts this disease is comparatively unknown. Here the cows are small, their food unstimulating, and the quantity of milk they yield limited. But in dairy districts, large towns and their vicinities, where the reverse of these exist, cows at the adult period of life are extremely liable to it.

Although I undertake a consideration of the treatment with some reluctance, it arises not from a conviction that treatment is inefficacious in itself, but because we are almost invariably called in to witness its failure; for the malady, from its treacherous character, and suddenness of attack, is frequently too far advanced previous to our attendance to admit of any remedial means being beneficially employed.

In what the treatment consists depends upon circumstances and period of our attendance, so that it is perfectly futile in one practitioner to say he always bleeds, or in another to say he uniformly dispenses therewith; for this, like other remedies, must be

applied to the state of each individual case so far only as symptoms warrant.

Believing that the disease consists, primarily and essentially, in congestion of the nervous centres, speedily terminating in effusion into the tissue—a tissue the integrity whereof is more than any other immediately essential to life, and yet one more than any other, from the nature of its texture, offering every facility to injury likely to result from this kind of disease—it behoves us instantly and energetically to apply our remedies.

And what remedies are there possessing greater potency than blood-letting and purgatives towards an early stage, before effusion has taken place, effecting the indications desired, namely, unloading the vascular system, preventing morbid deposit and change of structure incident thereon?

If, then, we see our patient, early before she falls, or even when recently down, with coma and other cerebral, the most obvious symptoms, the true spinal functions little or not anything impaired, in other words cerebral congestion alone existing, my first care would be to bleed instantly.

In undertaking this operation, my wish is, by removing the source of irritation, diminishing arterial action, and thereby preventing their ultimate effects, if continued, to make a powerful impression upon the system. In blood-letting, therefore, the abstraction should be rapid, and quantity withdrawn sufficient to effect these intentions. I would, therefore, continue the evacuation in a full stream until the warnings, which in time supervene, told me to desist. In few or no other conditions of system is there a greater tolerance of blood-letting; yet, let but a few more hours elapse, and directly the reverse occurs.

Having accomplished this, our next care is to administer purgatives, from a knowledge that they fulfil partly the same indications as blood-letting, in weakening arterial action, removing accumulations, and in causing derivation. Here, however, in addition to the usual difficulty of exciting purgation in cattle under disease, we have a peculiar unsusceptibility of stomach and bowels unknown at any other time; consequently the ordinary purgatives, and in usual quantities, are totally inefficacious. We must trust only to the most powerful. A combination, also, of several ingredients, is preferable to the administration of a single one, even should it be proportionate in strength to such combination.

The formula I would advise is this:—Ol. lini Ojss. pulv. sem. croton ℈i. hydrarg sub. ʒj. pulv. aloe. bbd. ℥ij. pulv. zingib. rad. ℥ij. The aloes should be powdered, dissolved in boiling water, to which the other ingredients are to be added, and carefully admi-

nistered. To facilitate the operation of medicine, clysters should be frequently employed, and if administered with the patent syringe, one end of the tube may be introduced with an arm in the rectum for a considerable distance, and a greater probability will thus be afforded of softening any hardened faeces. Clysters may be composed of soap or salt and water, with now and then an ounce of aloes in solution, and half a pint of oil of turpentine.

All our endeavours, after plentiful blood-letting, should be directed towards unloading the bowels, as being inferior to no other means in acting upon the nervous system; therefore, so long as power of deglutition remains, and torpidity of the bowels continues, one-third of the above formula ought to be given at intervals of four to six hours, combined, as the disease advances, with ounce doses of nitrous ether, increasing also the proportion of ginger, bearing in mind all may fall into the paunch, where it will lie comparatively inert. In the cow we have little fear of exciting superpurgation—at least we seldom see any permanently injurious effects from that cause, as too often occurs in the horse under disease.

Diuretic medicines are much advised by many practitioners, a judicious use whereof is proper, more especially as the disease advances, as tending, by other means, to effect the same ends contemplated by blood-letting and purgatives—promoting a separation of ingredients from an already vitiated circulating fluid, retention whereof, though highly injurious, the kidneys, from an imperfect performance of their functions, cease effectually to secrete.

An external application of stimulants, to be of full service, should precede departure of sensation, under which circumstances they are of great utility. I consider the application of a powerful blister immediately behind the ears, extending well back and beneath them, is a situation whereon counter-irritation can be applied perhaps as near the seat of disease, or, at all events, the nervous substance, as elsewhere. This may, as advised by some, be continued along the spine.

The beast should lie upon her belly, slightly turned to one side, raised before, and the head supported with straw; her position must be frequently changed, the teats continually drawn, and fomentations applied to the udder. The body should be kept moderately warm.

If possible, the veterinary surgeon should remain with his patient some time, watching carefully the symptoms, pulse, &c.; if reaction after blood-letting occur to any extent, he will then be able to decide, timely, the propriety of its repetition.

In spite of all exertions, should the symptoms progressively grow more unfavourable, we must consider whether an adminis-

tration of stimulants may not be justifiable to rouse or sustain the sinking nervous powers whilst our other curative means take effect.

When, however, as is too often the case, we are called in after congestion has passed, and is supervened by effusion, denoted by the latter train of symptoms previously mentioned, our chance of success is, indeed, small, this effusion almost invariably causing, by pressure or laceration of nervous tissue, a cessation, sooner or later, of functions dependant thereupon.

If power of deglutition be entirely destroyed, from a consequent liability of fluids to enter the trachea, we are not, without the stomach syringe, justified in administering anything whatsoever; and even with this excellent auxiliary, the unfavourable aspect of collateral symptoms will forbid the attempt if left to our own discretion. Blood-letting, if resorted to now, will only hasten death. Indeed the utmost caution is essential with respect to the propriety of blood-letting in every case where the cow has been some hours down. The system here is suffering and failing under the effects rather than the disease itself; and its sinking energies require all support the circulating fluid can impart. Bleeding has no effect in causing absorption of the effusion, which, being placed beyond constitutional influences, as it were, is not amenable to impressions made upon the circulation.

The only remote prospect of benefit here is to inject, by the stomach syringe, some alcoholic stimulant to induce a condition which might justify a trial of other remedies; and cases of this kind have occurred, wherein ultimate success has resulted from such mode of practice. Half a pint of brandy or whisky and gruel may be given, at two-hour intervals, till three doses have been taken, when, should no reaction supervene, all other means are useless. After the first stage has passed, and sensation is departed, the bladder, insensible to its accumulating contents, fails to act upon and expel them, until relaxation of its neck, in common with that of other sphincters, takes place, either from death or extension of disease to the true spinal system. This must always be attended to, and early evacuated by catheter, for an accumulation of urea in the system is alone sufficient to cause cerebral disease.

Any further treatment—which can only consist in modifications of that already stated to each case—will, like it, depend entirely upon circumstances. If we once succeed in producing action of the bowels, generally the disease is arrested, the ganglionic functions are resumed, milk is secreted, causing derivation of blood to the udder, and recovery takes place with astonishing rapidity. A gradual return of cerebral functions, and true spinal also— [illegible] impaired quickly follows action of the

owels. The eyes become sensible to light, breathing more egular and less noisy, the pulse acquires a firmer and more egular beat, the head is elevated voluntarily, and power of leglutition is restored. In no disease does a transition from a tate of utter helplessness to one of comparative recovery so oon occur, all taking place sometimes under twelve hours.

Although amendment may progress favourably, food should not be offered till the animal, by keenly looking out, betrays a want to partake. Gruel may be given if she will drink; otherwise it is better withheld.

Recovery sometimes takes place, with the exception of paralysis remaining in one or more extremities, or, it may be, merely confined to beneath the knees or hocks. Our treatment here, when the constitution permits, must consist of external stimulants to the limbs, or that part of spinal cord whence its nerves arise, or to both. An internal administration of such medicines as are likely to cause absorption of the irritating substance, as iodine, mercury, cordial aperients, is the best way to treat such cases. The constitution should be well supported with liberal allowances of good food, and if apparently resulting from debility, strychnia may be tried.

In concluding these remarks, my apologies for their length and imperfections, with the infringement upon your valuable time thereby occasioned, are such as I doubt not will gain your indulgence, being simply these—the importance of my subject, the conflicting statements respecting the disease, and an almost entire silence of recorded veterinary opinion consistent with my own, derived from frequent and careful investigation in the living and dead subject respecting it.

I cannot agree with those who suppose the disease primarily one of debility. That the symptoms ultimately assume such a character depends upon causes which I trust to have explained, together with the reasons I would administer stimulants in an affection apparently forbidding them. Cattle, even under inflammatory diseases are, with little harm, or indeed none, treated with stimulating or aromatic purgatives. The beneficial action of stimulants on cattle is known to every practitioner. And in what does their utility consist? I conceive that cattle are disposed to take on diseases of a low typhoid character, from their great vascularity of system. Disease of all kinds places the system less under influences of vital, and more under those of chemical, actions. In proportion to the vascularity of a part is its liability to decomposition or chemical action, which, unless counterbalanced by stimulus of the vital one, often preponderates, and death results.

Differences of opinion in matters of detail are, nevertheless,

inevitable; a mutual and friendly statement whereof, with due respect to the sentiments of others, without too mu preconceived bias, is one of the most effectual means of arriving at truth.

THEORY OF VEGETATION.

By Mr JOHN RUSSELL, Beanston, East Lothian.

THE more we investigate the laws of nature, the greater degree of simplification do we find they admit of. If we drop a stone upon the bosom of still water, the impulse will create a succession of eddies extending far and wide in all directions. These eddies, again, meeting with resistance of different degrees of intensity, will present a variety of appearances which no one would think of associating together as of one family. I say no one would think of associating them together unless he could obviously trace all the links of connexion between each and the original cause. As the stone upon the surface of still water, so is one of the simple and primary laws of nature, when brought into activity by the variety of objects which the universe presents for it to act upon. The present is an attempt to trace one of these laws, viz. the law of attraction, extending its influence to a remoter degree over the dominions of nature than is generally believed, and to point out the probability of its determining all the conditions of vegetable life.

In prosecuting this task, I will attach great value to the analogies of nature, and yet not greater, that I am aware, than they merit. For they are finger posts, of whose guidance the student of nature is glad to avail himself as he wanders, Isaac-like, through her complicated and ramified paths of wisdom. Through their instrumentality, philosophers have often been led to the most important and useful discoveries. Many important facts in chemistry and natural philosophy might be cited as examples. Man is placed in the universe like a savage ushered into a museum in a state of darkness. By means of the analogies of nature he has groped his way all around, and can now form a pretty correct idea of the nature of the apartment, as well as of the curiosities which it contains. Or, he has been plunged deep into an ocean of truth, infinite and of too vast extent for his forming an adequate idea of its nature or dimensions. Within that ocean he has striven to raise a solid footing for himself with all the industry of a coral insect. Successive generations have arisen and passed [illegible] leaving their work unfinished. We eagerly avail

ourselves of the discoveries of our predecessors, as a means by which we may build greater analogies. Thus do facts known serve as piers projecting into the ocean, from which we are unceasing in our endeavours to drive our piles into the deep and dark foundations of truths unknown.

What makes the vegetable take an erect position in the air? In asserting that it is the same universal law of attraction which also holds the planets in their spheres, and raises the tides of the ocean, I am not aware that I am borrowing an idea from any other person. On the contrary, I have carefully perused popular writers upon the subject, without discovering that the remotest allusion had been made to this as the cause. At the same time, the many analogies of nature which point in this direction render it extremely probable that such an idea has occurred to others before. In that case, my remarks, without possessing the merit of novelty, may claim that freshness which can only attach to the studies of him whose observations are drawn from the book of nature itself. The tree ascends in the air; the apple drops to the ground. The motion of the one is exactly the reverse of the other. Does not this suggest the idea that, if the apple obeys the law of terrestrial attraction, the tree obeys its antagonist law? Or that the tree has been reared into the air by the successive efforts of celestial attraction, which, as exerted at the earth's surface, is weak when engaged in combat with the opposing force of terrestrial gravitation? We know that solar attraction determines the position of every particle of matter upon the earth's surface. We know also that liquid matter and solid matter obey this law differently. Or, to speak more correctly, the law produces more obvious results upon the former than it does upon the latter. Inasmuch as solid matter, though influenced by it, holds the same unvarying position with respect to the earth's surface—not so liquid matter, as exemplified in the tides of the ocean. For it is perpetually changing its position, and is, as it were, vacillating in its allegiance between the earth and the heavens. We know, then, that attraction, emanating from the heavenly bodies, (which we will on that account call celestial attraction,) so far mitigates the effects of gravitation as to be capable of raising the tides. We know also that the matter of vegetables ascends in a liquid form. Nor can we doubt of the probability that this law exerts a secret influence over the works of nature which we cannot detect, or produces results which we see, although the imperfection of our faculties does not enable us to associate them with the producing cause. In the same manner as we know that heat is resident in bodies, while neither our senses nor our finest instruments enable us to discover its existence there. Let us suppose, then, that the sun and moon exert an attractive influence

over the juices of vegetable life, of the same nature as that which they exercise over the tides of the ocean; and, having made the supposition, let us examine and see if the vegetable kingdom unfolds to us any traces of its operation.

We know that the maximum of the moon's influence upon the tides is felt about the vernal and autumnal equinoxes. Can the agriculturist at these periods also detect her predominating influence upon his seeds and growing plants? Is it not notorious to the least observant that in harvest she performs a most important office in the ripening of his grain? And is it not also pretty well understood by the more observant that, at the vernal period, seed sown during her waning vegetates differently from seed sown during her increase? We have here, then, two simultaneous results —one upon the tides of the ocean, and the other upon vegetation;— by almost universal consent, the intelligence of mankind refer them to one and the same source. Why then should we hesitate in referring them to the same cause, and believe that if the moon, by the universally pervading law of attraction, assists in raising the tides —by the same law also she assists in raising the juices of vegetation? Again, the traveller, in crossing the Andes, is indebted to the canes and their liquid contents for the means of assuaging his thirst. He chooses to make his journey during the full moon, because he knows that then these truly living fountains will be copious and clear; but if he shall delay until her waning, their supplies will become exhausted and dried up. Whence, then, this mysterious sympathy between the plant and the ocean? Hath a God of benevolence placed it in the dreary solitudes of the mountain as a token for good only to the bold and enterprising traveller, and shall it be impious in us to use it as an index to the secret operations of nature?

But we ought to bear in mind that, if we have detected the lunar influence upon vegetable life, we have only detected it by means of its excess, and that, if it operates at all, it must be a constantly operating principle; and not only so, but if the moon, which has no heat and little light to bestow, exercises an influence altogether independent of light and heat, the sun, and other heavenly bodies, must exercise kindred influences. Suppose I were capable of pitching a stone into the air with sufficient force that it shall make several revolutions round the earth's surface, whenever the stone came to the sun's meridian, the first would make an ascent in its flight. The same would happen with respect to the moon. But it is evident that, in this latter case, the effect would be much more decided if the sun's influence were non-existent altogether. In like manner, if both sun and moon were removed out of the heavens, and it were possible for the earth, under these circumstances, to hold on its

present course, we would then come under the successive dominion of each of the planets, and matters would fall into that confusion which the absence of the master and mistress of the household would naturally create. Now, all these separate influences are in existence at one and the same time; the minor are not swallowed up in the greater; the equilibrium of the whole is only upset, or rather a momentum given to it, by the motions and preponderating influences of sun and moon. If we suspend a number of different weights from each end of a balance, and begin to transpose these weights, the arms of the balance will be put in motion. But if we have one or two largely preponderating weights, according as we may place these to this side or that, so will the arms rise or fall. The large weights therefore will alone determine the direction of the balance, while it is evident that each of the small ones will have an effect in regulating its motion. Such, then, I conceive to be an apt illustration of the effects produced upon all sublunary things by the hosts of heavenly bodies. Here, then, we have a powerful influence brooding over vegetable life: let us contemplate a little its probable effects, and see if it is capable of answering all the demands which the phenomena of nature make upon us. One and the same cause always produces analogous results, and, having tides in the ocean, we must look for tides of vegetation. And can its incipient rise in February, and termination in a full flood in July, be more fitly expressed by any word in the English language than by the word tide? Tides of the ocean happen twice a-day; the tide of vegetation happens once a-year. The first follow the sun's daily meridian; the latter follows his yearly meridian. The first are modified by the moon's relation to the earth and sun; the latter are not so modified, because to them the lunar influences may be taken upon the gross as an unvarying quantity. If the lunar influence upon the tides were non-existent, we would find them following regularly at a certain interval the sun's daily progress in the heavens; and, as the sun rose in the sky, the tides would rise also, until a certain regular interval after his meridian altitude, when they also would follow his downward motions. Now, what would happen if there was no moon in the case of the tides, with respect to the sun's daily progress, happens, in the case of vegetation, with respect to his yearly progress. No sooner does the sun begin to ascend in the heavens than vegetation also prepares to start; and no sooner does he begin to descend than vegetation also declines.

We are accustomed to regard solar heat as the vivifying power in the case of vegetable life; but, if we keep the above facts broadly in view, we will regard more favourably the theory that his heat performs only an auxiliary part. Solar heat liquefies and

refines the vegetable juices; in proportion to that heat, therefore, will be their ascent. Heat also renders liquids capable of holding a larger quantity of salts in solution. These salts form the valuable constituents of vegetables, and are, as it were, their frame-work. We have here an explanation of the rapidity of vegetation in warm weather, and also of the fact that warm seasons mature the finest grain; because in these seasons the ascending sap will hold the greatest amount of salt in solution. The most durable vegetable fibre is generally the product of warm climes, and we have the fact explained upon these principles, because in these climes it will be composed of the greatest amount of least soluble salts.

So far are plants modified by, and dependant upon, solar heat; but when we attempt to stretch this power a little farther, and by means of it to account for the rise and progress of vegetation, we find it utterly inadequate to explain existing phenomena. The most precarious stage of vegetation is gone through, and the first impulse (the most difficult of all impulses) is given to it, in the comparative absence of solar heat. Again, when we arrive at the last stage of vegetation, we have the greatest amount of solar heat, but then vegetation immediately begins to decline. But we know that heat is necessary to vegetation, and in proportion to the facility with which heat is acquired is the rapidity of a plant's growth. Let us suppose, then, that we have found in celestial attraction a momentum adequate to put vegetation in motion, independent of solar heat altogether. We may then have vegetation progressing in the comparative absence of solar heat; but in that case the plant will be making demands for a commodity so necessary to its existence upon every object in its neighbourhood. Hence we ought to have an excess of cold in February, when the vegetable kingdom, like a mass of ice dissolving, makes demands upon the other departments of nature for the heat necessary to raise it from death to life. Hence, also, we ought to have an excess of heat in July, just after the subsiding tide of vegetation has ceased to make those demands for heat which, at an earlier period, had well-nigh beggared the other provinces of nature. Hence, also, frost in spring ought to be regarded as an obstruction to vegetation, created mainly by its own progress, in the same manner as the wave at the prow of a ship may be looked upon as in some measure an index of the progress she is making through the ocean.

If we regard vegetation as entirely dependant upon solar heat, we have not only a number of phenomena we cannot account for, but I can see no reason why we ought not to have one season following another capriciously as to character, with an early following a late season, and again this last followed, it may be, by

an early one. But what is the fact? We have a succession of early seasons followed by a succession of late ones. And we have these phenomena beautifully accounted for by supposing the tide of vegetable life to be put in motion by celestial attraction. For the hour of flood-tide to-day determines the hour of flood-tide to-morrow; and not more certainly does the extreme vibration of a pendulum on one side produce an extreme vibration on the opposite side and back again than one late season is followed by another of the same character.

The many traces of contrivances discovered in the universe have often formed the subject of admiration to pious minds. The aptitude and fitness of things has been selected as not the least valuable illustration. And in this respect the adaptation of the cycle of the plants to the cycle of the seasons has been elaborately dwelt upon. But superficial observers often praise the expertness of the contriver, at the expense of the real wisdom and simplicity of the plan which pervades the works of nature. They seem to regard it as the most difficult problem the Deity had to perform to make one thing fit another, like a mechanic making two clocks to keep time with each other. An acquaintance with the facts of nature, however, is calculated to inspire different ideas from these—ideas which are more in accordance with the unity and wisdom of the Deity. We ought not to regard one thing as made to fit another so much as we ought to consider one series of things flowing out of another in beautiful order and regularity of succession, like the majestic oak rising out of the earth. First the acorn, then the germ, afterwards the stem and trunk, spreading their arms far and near, defying the blasts of centuries, and sheltering with their foliage the infant families of many winged generations. Now this simplicity of plan ought always to guide us to the simplicity of means employed. In other words, the countless analogies we discern scattered through nature ought in many cases to lead us to the contemplation of one and the same law operating under different modifications. Let us apply this reasoning to the case in hand. The law of attraction regulates the seasons of the year; and these, again, it is generally believed, regulate and determine the periods of the plant, by at first putting the juices in motion, and again maturing them after it has arrived at its perfect growth. Not so, say we; but one and the same law—this law of attraction which regulates the earth and the heavens—gives a call to both; and the plant and the season simultaneously obey it like two sleepers awakened by the hasty admission of rays of light into their apartment. By this means we shall not only have the general cycle of plants adapted to the general cycle of the heavens, but

we shall also have the adaptation complete in particular cases. I mean we shall have a tendency on the part of the plant to vegetate soon in an early and tardily in a late season.

But it may be asked how, upon this hypothesis, do you account for the fact that plants transposed from one latitude to another continue to obey the call of their native clime in preference to the clime of their adoption? I answer by the same reasoning that I would account for the circumstance that the tides of the ocean would continue to obey their present appointed periods for many hundred years to come, even although the influence of sun and moon were to be immediately withdrawn.

But it may again be objected that the growth of the tree does not present exactly the converse of the fall of the apple, inasmuch as the last falls to the ground in a direct line, whereas the first frequently ascends in a great many irregular lines, and suggests rather the idea of a bird or a fish seeking support from the elements in which they move than of a projectile obeying the laws of motion. To correct this impression, suppose a ball of slightly adhesive materials projected with considerable force into the air. So long as the adhesive power of the ball remains undestroyed it will proceed in a straight line. Gradually, as its adhesive power is being destroyed, it will throw off particles of matter from its sides. So long as these felt the original impulse, they would take nearly the same relative direction to the flight of the ball that the branches of a tree take to its stem. But the points of resemblances are not yet exhausted. No sooner does motion cease than both the plant and the projectile fall to the ground. This indeed is prevented in the tree by a firmness of texture it acquires, enabling it to support itself by mechanical means; but is exemplified in the grasses and cereal plants which, if they do not fall, also acquire a firmness of texture they had not while in a growing state. Even the tree is less liable to be uprooted by the storm when growing and lively than during winter when the sap is stagnant, although in the former case, by means of its leaves, it presents a larger surface for the storm to act upon. This ought to be held by us as proof that one and the same power causes the vegetable sap to ascend, and also sustains the growing plant in the air.

It is the belief of most philosophers that the planets are the abodes of animal and vegetable life. Now, although it may appear absurd to found an argument upon what, in the opinion of many, may be considered as nothing better than the "baseless fabric of a vision;" yet he, whose mind is imbued with the silent and unobtrusive teachings of nature, will consider that the belief alluded to rests upon evidence as good as that which often guides correctly the intercourse of social life; that, in truth, the

probabilities on its side are far greater than those which determined the actions of Columbus when he proceeded across an unknown and pathless ocean to discover an unheard-of continent.

Now, if all the planets are the abodes of life, for what purpose were their numerous satellites given? If they are intended only to give light, they do not seem to be contrived with that aptitude and fitness which characterise the plans of the universe. Nor would this supposition give any satisfactory answer to the inquiry, why, in proportion as we recede from the sun, do we in general find the greater number of satellites given to each planet? We have been contending for the satellite of our own planet exercising an influence upon vegetable life, of the same nature as that which she exercises over the tides of the ocean. Now the lunar influence preponderates over the solar in the case of the tides—and we have no reason for believing that, if sun and moon exercise an attractive influence upon the juices of vegetable life at all—I say we have no reason for believing otherwise than that the lunar influence here, at least, equals the solar. Hence there would arise a necessity for increasing the number of satellites in proportion to the distance from the sun, to compensate for the weakened power of solar attraction, as exerted at any particular point of the planet's surface, owing to its distance from the centre of our system.

NOTES ON ANIMAL LIFE, AND ON THE EFFECTS OF TEMPERATURE ON ANIMALS.

By Mr D. BAIN, Edinburgh.

I HAVE so often ventured to address the readers of this journal upon the subject of shelter, as a mean of improvement in agriculture, and as likely to be beneficial to animals, that, on noticing that Professor Liebig had touched upon the subject in his work on "Animal Chemistry," lately published,* I considered it my duty thoroughly to examine that work. I have done so, and am exceedingly happy to find that he has confirmed every point I have advanced. This is so important, that I think I shall stand very generally excused for reporting that confirmation; and that, therefore, will be the chief business of this paper. At the same time, I shall do what I can to make more generally known, if possible, several other doctrines of this great man likely to be useful, as a matter of interest to the practical agriculturist, and which he might not otherwise have an opportunity of seeing.

* English edition. London, October, 1843.

For example, it has long been *said* by philosophers, that nothing is lost; all is reproduced, or the material world could not be supported. Liebig has *shewn* it,

One part of the crops employed for fattening sheep and cattle (he observes) is consumed by man as animal food; another part is taken directly as flour, potatoes, greens, vegetables, &c.; a third portion consists of vegetable refuse and straw employed as litter. None of these materials of the soil need be lost. We can, it is obvious, get back in the solid and fluid exuviæ* of men and animals, and in the bones, blood, and skin of slaughtered animals, all the constituent ingredients of the consumed food, soluble and insoluble. It depends upon ourselves carefully to collect all these scattered elements, and to restore the disturbed equilibrium of composition in the soil. We can calculate exactly how much, and which of the component parts of the soil, we export in a sheep or an ox, in a quarter of barley, wheat or potatoes, and how much we have to supply to restore what is lost to our fields,

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If the manure supplies an imperfect compensation for this loss, the fertility of a field or of a country decreases; if, on the contrary, more is given to the fields, their fertility increases. An importation of urine or of solid exuviæ from a foreign country is equivalent to an importation of grain and cattle; for in a certain time the elements of those substances assume the form of grain or of fodder, then become flesh and bones, enter into the human body, and return again, day by day, to the form they originally possessed. The only real loss of elements we are unable to prevent is of the phosphates; and these, in accordance with the customs of all modern nations, are deposited in the grave. For the rest, every part of that enormous quantity of food which a man consumes during his lifetime, (say in sixty or seventy years,) and which was derived from the fields, can be returned to them. We know, with absolute certainty, that in the blood of a young or growing animal there remains a certain quantity of the phosphate of lime, and of the alkaline phosphates, to be stored up and minister to the growth of the bones and general bulk of the body; but that, with the exception of this very small quantity, we receive back, in the solid and fluid excrements, all the salts and alkaline bases, all the phosphate of lime and magnesia and consequently all the inorganic elements which the animal consumes in its food; and what is not thus directly given back, the air takes up and gives back.†

Before proceeding to the protection of animals, a few words may be allowed on their nourishment and even production.

A French physiologist (but whose name I forget) gave out a theory many years ago to this purpose—that wherever there is abundance of food, nature takes the hint, and produces the most prolific animal, that is, the female; and, on the other hand, when food is not abundant, the male is produced. Were this an ascertained fact, it would be very convenient; as a farmer, by keeping his cattle moderately supplied with food or the contrary, at particular seasons, might produce what species of stock he preferred; only, in the opinion of many, he must take care not to feed too highly, or he would have no stock at all. Every one, by reflection, or future observation, may determine for himself whether there is any probability in this. It is certainly a strange fact, (considered in connexion with this theory,) that by the census of England and Wales just published, the females

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* *Excrementa*—things not used; exceeding the purposes of increase.

† Letters on Chemistry, 1843.

of the human species are in excess in England, upwards of $2\frac{1}{4}$ per cent.,—while, in the less rich principality of Wales, the excess of females is only about $1\frac{5}{7}$ per cent.

No perfect returns have yet been published for Scotland and Ireland; but according to this theory they should resemble Wales rather than England. As the recruiting serjeant is seldom out of any part of Ireland, and yet there is no complaint of a majority of females, it would seem as if the actual state of the things there went to confirm this theory.

It is only after the animal has been produced, however, that science can deal with it; and from this period Professor Liebig is most instructive. I will give his theory of animal life at the outset, that the various parts of which it is composed may be more easily understood as they appear. It is, that the whole business of nourishment is to supply the blood necessary to keep up the volume of the body under the waste that is constantly going on, whether in a state of rest or exercise, but particularly the last: and next, to retain it of the proper heat for vitality, and to support the respiration necessary in the different states of rest or exertion. Two different species of aliment are required for these purposes, both in man and in the inferior animals; and the first species, which is found in the *cerealia* (or corn) chiefly, but also in the flesh of animals, goes to form blood, bone, muscle, &c., but *not* fat. The other, found in the *legumens* chiefly, (meaning, from *Lego* to *gather*, the crops gathered of old, rather than reaped,) beans, pease, lentils, maise, &c., goes to form *fat*; and so far as not used in respiration, creates fat. In confirmation of this, he says—

Chemical researches have shewn that all such parts of vegetables as can afford nutriment to animals, contain certain constituents which are rich in nitrogen; and the most ordinary experience proves that animals require for their support and nutrition less of those parts of plants in proportion as they abound in the nitrogenized constituent. Animals *cannot be fed* on matters destitute of those constituents. These important products of vegetation are especially abundant in the seeds of different kinds of grain; and in pease, beans, and lentils, and in the roots and juices of what are commonly called vegetables. They exist, however, in all plants without exception, and in every part of plants in larger or smaller quantity.

These nitrogenized forms of nutriment in the vegetable kingdom may be reduced to three substances—vegetable fibrine, vegetable albumen, vegetable caseine. The juice of grapes is especially rich in vegetable fibrine, but it is most abundant in the seeds of wheat, and of the cerealia (or corn) generally.

When the clarified juice of nutritious vegetables, such as cauliflowers, asparagus, mangel wurzel, or turnips, is made to boil, a coagulum is formed, which it is impossible to distinguish from the substance which separates as a coagulum, when the serum of blood, or the white of an egg, diluted with water, is heated to the boiling point. This is vegetable albumen, and so named from the albumen, or white of an egg, which it resembles. It is found in the greatest abundance in certain seeds—in nuts, almonds, and others—in which the starch of the gramineæ (or grasses) is replaced by oil.

This accounts for the fattening qualities not only of the products here enumerated, but of linseed, chestnuts, &c.; in short, all nuts not poisonous.

The third nitrogenized constituent of the vegetable food of animals is *vegetable caseine*, [or cheesy matter.] It is chiefly found in the seeds of pease, beans, lentils, and smaller leguminous seeds. Like vegetable albumen, this is soluble in water; but its solution is not coagulated by heat. When the solution is heated, and an acid added, [as in curdling milk,] a coagulum takes place, just as in animal milk, and hence its name *caseine*.

These three nitrogenized compounds, vegetable fibrine, albumen, and caseine, are the true nitrogenized constituents of the food of graminivorous animals; all other nitrogenized compounds occurring in plants are either rejected by animals, as in the case of poisonous or medicinal plants, or else they occur in the food in such very small proportions, that they cannot possibly contribute to the increase of mass in the animal body. The chemical analysis of these three substances has led to the very interesting result that they contain the same organic elements, united in the same proportion by weight; and, what is still more remarkable, that they are identical in composition with the chief ingredients of blood, animal fibrine, and albumen.

All plants, besides, contain a certain quantity of iron, which reappears in the colouring matter of the blood; and vegetable fibrine and animal fibrine, and vegetable albumen and animal albumen, hardly differ even in form. If these principles be wanting in the food, the nutrition of the animal is arrested; and when they are present, the graminivorous (or grass-eating) animal obtains in its food the very same elements on the principles of which the nutrition of the carnivorous (or flesh-eating) animal depends.

With the aid of these discoveries, how beautifully and admirably simple appears the process of nutrition in animals, and the formation of their organs in which vitality chiefly resides!"

Thus much of the food of animals in general.

The young animal receives the constituents of its blood, in the caseine of the milk, the chief constituent of its mother's blood. To convert caseine into blood, no foreign substance is required; and in the conversion of the mother's blood into caseine, no elements of the constituents of blood have been separated. When chemically examined, caseine is found to contain a much larger proportion of the earth of bones than blood does, and that in a very soluble form, capable of reaching every part of the body. Thus, even in the earliest period of its life, the developement of organs in which vitality resides is dependant on the supply of a substance identical in organic composition with the chief constituents of the blood.

The blood of the young animal, its muscular fibre, cellular tissue, nervous matter, and bones, must derive their origin from the nitrogenized constituents of milk; for butter and sugar of milk contain no nitrogen.

From this last extract we see convincingly the necessity of feeding all young animals with the natural food, the milk of their mothers; for it is here shewn, that without it they can neither form blood nor muscles, nor nerves, nor bones. A child fed upon arrow-root, for example—which is starch—has no materials for forming blood for itself, a tooth nor a nail, a muscle nor a tendon, nor a bone. It does its best by working up any remnant of nourishment given, and its own substance as long as it lasts; but it at last becomes soft in the bones, and in the whole fabric, the little strength that may have been in it being wasted in carrying on the war with disease as long as possible, and so all gradually wasted. In the same way, calves are never found to prosper on anything but milk, particularly not on a common substitute, hay-tea. The reason is the same in their case as in the case of a child—they have no materials proper for carrying [illegible] their frame; and the decay and smell which observant [illegible] imperfect assimilation

of the food given them, or internal decomposition of the muscles, &c. that had been formed, in supplying blood and bones. Better it were, as it would seem from these principles, to give them the pulp or decoction of pease, beans, or lentils, than of hay or any other vegetable; and we have it now explained, on recognisable principles, why physicians have so long been in the habit of recommending to nurses and to children, as soon as they can take it, the use of farinaceous food. It is because it supplies the greatest quantity of the substance of blood, muscles, and bones.

When we wish to supply, rapidly, the waste of strength in horses, and enable them to endure fatigue, we are, upon the same principle, compelled to give them corn. The same is true if we wish to increase *the flesh* of cattle. The *fat* is a different substance, and differently created. It is created, as has been mentioned, through nonazotized substances, as may be afterwards shewn; through *starch* from potatoes, &c., and *sugar* and *gum* from grasses and vegetables. These last form the chief dependance of graminivorous animals during their lives; and "the most abundant and widely extended of the substances of this class is amylon or starch. It occurs in roots, seeds, or stalks, and even in wood; deposited in seed and stalks in different forms indeed, but identical in chemical composition." From ample details upon this subject, it is concluded—"It is obvious in the system of graminivora, whose food contains so small a proportion relatively of the constituents of blood, that the process of change in *their* processes must go on far less rapidly than in the carnivora. Were this not the case, a vegetation a thousand times more luxuriant than the actual one, would not suffice for their nourishment."

A very extraordinary but convincing reason is then given why we should pursue the cultivation, and prefer the use of vegetable, to too much animal food.

Man, when confined to animal food, requires for his support and nourishment *extensive sources of food, even more widely extended than the lion and tiger.* A nation of hunters [or shepherds] on a limited space are utterly incapable of increasing its members beyond a point which is soon attained. The carbon necessary for respiration must be obtained from the animals, of which only a limited number can live on the space supposed. But 13 lb. of flesh contain no more carbon than 4 lb. of starch, [derived from vegetables;] and while the savage, with one animal, and an equal weight of starch, could maintain life and health for a certain number of days, he would be compelled, if confined to flesh, in order to procure the carbon necessary for respiration during the same time, to consume five such animals.

All travellers blame the intemperance of savages in consuming flesh. This explains that it is no *intemperance, but a natural necessity.* We have been accustomed to think it enables them to last longer in seasons of scarcity; but neither is this so. Savages have invented the use of tobacco smoke, *to stay the of process*

change in their system, and so avert hunger, from arresting waste of substance, not from having reserved substance to waste. Messrs Robertson, in their "Letters on South America,"* have described most conclusively the destruction of flesh necessary to sustain life, not among savages only, but civilized men also, when resorted to as their only food. They are describing a night encampment of Gauchos, or South American shepherds, on the Pampas, or plains of the Entre-rios :

The first enjoyment of the Gauchos after hard labour is their maté or tea. Theine, (it may be here stated,) caffeine, theobromine, &c., (or the essence of tea, coffee, and cocoa,) are found, on examination, to be in all respects identical. They supply in part the nitrogen required by hunger, and in part arrest the rapidity of change; and hence their grateful character, either to persons living high (that is, eating much flesh,) or suffering under fatigue. They then describe the killing of an ox, and immediately roasting the prime parts. Salt is sprinkled over each roast, as it is placed in the centre of each little knot of gourmands, and then, with fingers used as forks, and knives as sharp as their own hunger, the Gauchos commence their glorious feast. They have nothing but the beef and the salt; they care for nothing more.

Nor does this last them long.—Travellers in North America represent the Esquimaux, also, as for ever eating and cooking; and sailors on board the London smacks, who used to eat more beef than bread, were also for ever at it. It will be seen that all this is necessary, in feeding upon animal food, "to supply matter for respiration," (of which there is little in that food,) and that feeding on beef, as a habit, would turn men into cormorants.

It is easy to see, from these considerations, (continues the Professor,) how close the connexion is between agriculture and the multiplication of the human species. The cultivation of our crops has ultimately no other object than the production of a maximum of those substances which are adapted to assimilation and respiration in the smallest possible space. Grain and other nutritious vegetables yield us, not only in starch, sugar, and gum, the carbon which protects our organs from the action of oxygen, [in the outer air,] and produces in the organism the heat which is essential to life; but also in the form of vegetable fibrine, albumen, and caseine, our blood, from which the other parts of our bodies are developed. Man, when confined to animal food, *respires, like the carnivora, at the expense of the matters produced by the metamorphosis of the organized tissues*, (his own muscles.)

How wisely they reason, therefore, who would turn us again to pasturage, and more animal food! In fact, allowing the ground to be covered with only such products as cattle will eat, and then eating the cattle, is something like the conduct of the islanders of Saint Kilda, who, though surrounded by fish, take none themselves, or next to none, but allow the birds to eat them, and then *starve on the birds and their eggs.*

Animals eating fully, but at the same time taking so much exercise, or being in the open air, and particularly air so cold as to exhaust the amount they eat, (for air and exercise, and particularly cold air, are "huge feeders,") may be in excellent health, and

* John Murray, London, 1843.

Wen in good condition, but can hardly get fat. On the other hand, when, with an abundant supply of food, we check the progress of cooling and exhalation, as we do when we feed them in stables, where free motion is impossible and cold is excluded, the result is very different.

The stall-fed animal eats and reposes merely for digestion. It devours far more food in the shape of nitrogeneous compounds than is required for reproduction, or the supply of waste alone; and at the same time it eats far more substances devoid of nitrogen than is necessary merely to support respiration and keep up the animal heat. Want of exercise and diminished cooling are equivalent to a diminished supply of oxygen, (that is, to a diminished breathing and exhalation;) for, when these circumstances occur, the animal absords much less oxygen than is required to convert the substances destined for respiration. Only a small part of these substances, therefore, is expelled from the body; and all the remainder is employed in the production of a substance which, in the normal or natural state, only occurs in a small quantity, as a constituent of the nerves and brain. This substance is fat. When the fattened animal is allowed to move freely in the air, or to draw heavy burdens, (or suffer fatigue of any description,) the fat again disappears.

From which we may infer the wisdom of attempting to fatten cattle in the cold, or on pastures admitting or requiring fatigue; or, having fattened them, of allowing them to be driven far, or fatigued or knocked about in any way. In all these circumstances, and particularly the last, we are not only cruel to the animals, but picking our own pockets at an inconceivable rate.

It is evident, therefore, that the formation of fat in the animal body is the result of a want of due proportion between the food taken into the stomach and the oxygen absorbed by the lungs and skin, (*i. e.* the balance of food not thrown off by air and exercise is fat.) A pig, when fed with highly nitrogenized food, (the corns,) becomes full of flesh; when fed with potatoes, (starch,) it acquires little flesh, but a thick layer of fat.

No doubt this extends to all animals; and, could cost be reconciled with profit, might teach what in every case should be done, to produce exactly the substance required—that is, flesh or fat.

Generally the formation of fat is intimately connected with the respiratory process *and the temperature*; and, under gentle respiration and moderate warmth, fat may be formed; *otherwise not, whatever may be the amount of food.*

The excess of the constituents of blood (nitrogenized matter) forms the flesh and other organized tissues, while that of starch, sugar, &c. (and connected with respiration) is converted into fat. When animals are fattened on food destitute of nitrogen, only certain parts of their structure increase in size, (in a goose, the liver—in other animals, the fat, not the flesh.)

We receive from this, therefore, a clear light on an infinite number of facts connected with animal life of every description which we had not before. We see why the country woman, fed, not on the plainest food, (as it is termed,) but the food most capable of producing milk, makes the best nurse; why the child nursed by this woman, and partaking of the food most capable of producing *blood and bones*, is the stoutest child; and why the

child removed from, or deserted by, its mother, has hardly a chance for being perfect in body or mind. It is the same with all other young animals not finding a substitute in some way. Again— "A child slightly clothed, can bear cooling by a low external temperature without injury to health," because, breathing quick, he is changing matter very fast, and, consequently, has great internal heat; and "a high temperature, which impedes the change of matter, is in him followed by disease." Breeders will know if this is the case with other young animals; and if so, we see the cause. We see from this why the Londoner, feeding on his fine things—his tea, (which is an arrester of growth,) his Indian arrow-root, &c., instead of the farina of corn, or even of rice, containing the elements of blood and bones—has neither bones nor dimensions, hardly teeth or claws; while the ploughman, and particularly the Scottish ploughman, fed from the beginning on milk and on farina—that is, stir-about or porridge, sowens or flummery, and brose, barley broth, &c.—has, *not* from his hard labour, for that is exhausting, nor from exposure to the air, for that also is a powerful exhauster, but from eating the food most easily assimilated, and possessing the elements of bones, and muscles, and fat, a due proportion of all the requisites to health and strength; and if he is not tasked to an extent countervailing his advantages, is healthy and strong. We see from this that, if a man would be strong, or keep his servants strong, he will resort to the products of corn; if weak and fat, to the fat of animals. We see from this, that a gentleman following the hounds, at the expense of great fatigue to himself and horse, and thinking he does something exceedingly useful to health, because it enables him to eat a dinner corresponding to his fatigue, does nothing so very meritorious; on the contrary, both by his fatigue and his feeding, he may be overstraining his system; and, by his excessive eating, he is certainly tending to deprive persons more usefully employed of the chance of having enough. We see from this, why savages, or others eating flesh exclusively, are, like the carnivora, wiry and thin; and aldermen, eating more soups and fat than bread, are without bones or breath, or even fat *of a wholesome character.* They are like pigs fed on slops. We see from this, why a lady, taking little exercise, has no reason to plume herself on moderation in eating or drinking; for, in the circumstances, it is hardly possible for her to be other than moderate, unless, like the quiet pig, she has a talent for secreting fat; while her sister of Yorkshire, riding at five-barred gates like a gentleman, must eat like a gentleman.

[illegible] hasten, however, to the rea[l] business of this paper, namely, [illegible] facts [o]f temperature [o]r [a]nimal life; but there are so

many fruits to be gathered on every side, that our onward progress is exceedingly difficult. For example—

The presence of free muriatic acid in the stomach, and that of soda in the blood, prove, beyond all doubt, the necessity of common salt for the organic processes; but the quantities of soda required by animals of different classes, to support the vital processes, are singularly unequal. Again—It cannot be accidental that the life, the developement of a plant, is dependant on the presence of the alkalis which it extracts from the soil. This plant serves as food to an extensive class of animals, and in these animals the vital process again is most closely connected with the presence of these alkalis. We find the alkalis in the bile, and their presence in the animal body, is the indispensable condition for producing the first food of the young animal; for, without an abundant supply of potash, the production of milk becomes impossible.

Alkalis are useful to general health, therefore, and indispensable to giving milk. But *in fattening, salt must be avoided;*

For it is worthy of observation, (says Professor Liebig,) in reference to the production of fat, that the absence of common salt, (a compound of sodium which furnishes soda to the animal organism,) is favourable to the formation of fat; and that the fattening of an animal is rendered impossible when we add to its food an excess of salt, although short of the quantity required to produce a purgative effect.

It is possible that this may account for the fact that the islands of Guernsey, Jersey, Alderney, and the British islands generally, being loaded with spray from the sea, their cows are excellent milkers, while the beef of all their cattle is, I believe, indifferent.

Our Scottish feeders have at once found out, that grass too much impregnated with salt does not feed, and they have rejected it accordingly; may it not, however, be useful in producing milk?

I intended, in the course of this paper, to have gone somewhat farther into the subject of *continuous good feeding*, (one of the most conspicuous effects of a successful agriculture,) in keeping the meat of this country superior to anything that can be opposed to it, even from any quarter, but my space is already exhausted. Every one knows, however, the effects of continuous good feeding, if only in hastening forward animals; an ox of two years old being now superior to what they lately were at three, and so in proportion of other animals. Buenos Ayres now threatens us with beef at a penny a-pound prime cost, and so may other countries whose pastures are natural and extensive. The Messrs Robertson, in their "Letters on South America," state that the South American Pampas "teem with a capital breed of cattle. Finer flavoured or juicier meat than theirs is not to be found in any part of the world, not even in Leadenhall market;" and these gentlemen know many parts of the world, and Leadenhall market well. Yet it is found that, after salting at least, the meat is not good. It is not properly *mixed.** Perhaps it never is so as a general thing; and the reason I take to be, that, in summer in that country, the pastures are completely burnt up, except in

peculiarly secluded spots, when the cattle, of course, become reduced to fibre, and if this reduction is carried too far, the fat may never again mix. The same will be true in countries liable to severe winters, and with an imperfect agriculture. It was once so with ourselves. Now, our winter feeding may be even more powerful than our summer, and it is only in the pastoral districts that cattle need go back. If Professor Liebig shall add but confirmation to the practice of feeders in regard to the creation of fat, this country may, through the opulence at once and intelligence of its agriculturists, continue to stand high beyond all competition, for their means will enable them to do what their intelligence may point out as proper to be done; and properly mixed meat is only meat with its cells enlarged by full feeding, and rest, and warmth, and filled with fat, the produce of a particular species of food.

And now as to temperature.

The manifestations of the vital force are dependant on a certain temperature. Neither in a plant nor an animal do vital phenomena occur when the temperature is lowered to a certain extent. The abstraction of heat must be viewed as quite equivalent to a diminution of the vital energy. When the temperature sinks, the vital energy diminishes, (unless supplied with a corresponding excess of food.) Our clothing [or warmth from any cause] is merely an equivalent for a certain amount of food. The more warmly we are clothed, the less urgent becomes the appetite for food; because the loss of heat by cooling, and consequently the amount of heat to be supplied by the food, is diminished. If we were to go naked, like certain savages, or if, in hunting or fishing, we were exposed to the same degree of cold as the Samoyedes, we should be able with ease to consume 10 lbs. of flesh, and perhaps a dozen tallow candles, as warmly-clad travellers have related with astonishment of these people. We should then also be able to take the same quantity of brandy or train oil without bad effects, because the carbon and hydrogen of these substances would only suffice to keep up the equilibrium between the external temperature and that of our bodies. According to the preceding exposition, the quantity of food is regulated by the number of respirations, by the temperature of the air, and by the amount of heat given off to the surrounding medium.

I would fain give the beautiful, because decisive and useful illustrations the professor gives in shewing the effects of the climates of Jamaica and India, and even Italy, in diminishing the amount of food required; so great in the warmer countries, that the Englishman, feeling himself unable to consume what he has been accustomed to do in his colder native climate, and ignorant of the physical laws of his constitution, fancies himself unwell, and by art endeavours to stimulate himself to unnatural repletion, and thereby induces the disease he would avert; but this would only lead us farther from our purpose. Even what I have said, however, shews conclusively, that it is very ignorant in the natives of one country to judge of those of another from their own experience and feelings only; or even for the inhabitants of the more temperate parts of the same country to judge of the inhabitants of the less temperate, warmth being in so far a substitute both

for food and drink, and rendering unnecessary or unpleasant to the one, things that may be indispensable to the health and even existence of the other.

Next—Warmth and shelter being to the human race, and to all life, animal and vegetable, equal to a certain and considerable quantity of food, are we not guilty of the greatest folly in continuing to leave our fields unsheltered, whether bearing crops of corn or of grass, and at the same time the animals nourished upon them, whether for growth, or in preparing them, for human food? We see clearly that the reduction of temperature, both as to animal and vegetable life, is one of the greatest causes of waste. An animal or a vegetable that, under a mild or genial climate, would be fully fed, under a cold and ungenial one is starved and destroyed. A field may continue green, under even an unfavourable climate, a cold and scourging, and all but withering wind, but its produce has no comparative volume or succulence; it is rendered rigid, and stunted, and dry: and an animal pasturing on that field may continue to exist, but, both from the inferiority of its pasture and the coldness of its climate, it is either deteriorated instead of being improved, or if it improves, it does so under every difficulty, and a very great waste of food. It has been declared, as we have seen, by the greatest of living physiologists, that in such circumstances *it cannot get fat;* it merely holds its own, at a great expense of food to its owner and labour to itself, or it goes back. We have seen, in particular, that to feed animals, so as to prepare them for human food, and this on principles of reason and economy, requires the greatest care; care to prevent waste of their strength, by fatigue or exposure; and in both, of their food and individual and national wealth. "The slightest motion of a finger," (says Professor Liebig,) "consumes force; and in consequence of the force expended, a corresponding portion of muscle diminishes in volume, and must be replaced by food;" and "*the cooling of the body*, by whatever cause it may be produced, increases the amount of food necessary. The mere exposure to the open air, in a carriage or on the deck of a ship, by increasing radiation and vaporization, increases the loss of heat, and compels us to eat more than usual food. The same is true of those who are accustomed to drink large quantities of cold water;" and all these being undeniably true, what a waste of capital, and, as it may be called, intention, there is, in sending sheep and cattle to wander on cold and bare hills; all that they can possibly collect of food being wasted, or more than wasted, in the process of collecting it; or to stand in even rich and valuable pastures *unsheltered*, the air depriving them, even without fatigue, of all that they can eat!

Reasoning, for the first time, with some certainty, from the

facts here presented us, we see it to be proved in man, that though strong foods will support him, they will not do so either economically or well; but that, to support respiration advantageously, we must, to meats and even the farina of corn, add the starch of the legumens and the sugar and gum of plants. Reasoning from these principles as to the inferior animals, we should infer that though corn and other strong feeding may give an animal blood, and, of course, bone and muscle, they will not give him wind nor fat; but that for these he must have vegetable food, (more commonly so called,) and time to digest it. On the other hand, though the legumena and vegetable food may put him in *seeming condition*, they may not give him muscle or strength. These are points on which there can be no doubt, if there is any faith to be placed in these facts and reasonings; but all the minutiæ, or even other leading points in the question of feeding, are still to be considered. In the same way we have yet much to learn as to temperature, beyond the mere fact that comfortable warmth is preferable to starvation; but how far it is proper that the temperature of a stable, for example, should differ from the air in which the animal has to labour, and what precautions should be taken to secure an animal shut up, (either alone or in company,) the benefit of a pure air, are points that have been very little considered.

The following would seem axioms, however, which we may adopt without hesitation:—

First, That to leave corn-fields or pastures unsheltered, is to leave the air to counteract and carry off a great part of the results of all our labour and expense. It scourges equally the plants and the soil.

Second, That to leave animals to pasture in the *cold*, is to leave them to struggle with *the climate* for *their existence;* and that, in such circumstances, they can never improve, at least to anything like the extent to which they would improve if properly protected.

And, *lastly*, That to *fatten* animals on principles of rational economy, they must be placed in situations in which they may not only have suitable food, but also warmth and rest; and that, being fattened, they should never be fatigued, nor in any way annoyed, as all fatigue leads to a diminution of fat. Even on a journey, therefore, though their last, their food should always equal their labour, or they must deteriorate exactly in so far as it falls short.

If proper shelter of growing timber, therefore, cannot be raised for our fields and cattle, something else should be attempted. Anything but this is waste. For sheep and cattle, in particular, if neither shelter upon a large nor upon a lesser

scale can be effected in the usual manner, sheds or fences of more or less length should be provided, capable of being moved from field to field, to which the animals might occasionally resort or be driven; for we may assure ourselves, there is hardly an expense equal to the effects, both to fields and cattle, of a gnawing or destroying air. It is a devourer on the largest scale; in a habitually cold climate, a complete counteractor.

Such are a few of the many hints and valuable truths to be drawn from this section of the labours of Professor Liebig.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS, AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR RAVAGES.—No. XV.

By the Rev. JAMES DUNCAN, M.W.S.

KEEPING in view, as far as is necessary for the present purpose, the order in which systematic entomologists have arranged the multifarious objects of their science, we now come to the consideration of an extensive tribe of small moths, which are in various ways injurious both to animal and vegetable produce, whether it be in a natural state, or after it has passed through the hands of the manufacturer. They are so considerable in amount, that a particular notice of all the kinds more or less noxious would swell our catalogue, already sufficiently ample, to undue dimensions. We shall notice, therefore, only the distinguishing features of the different families or groups into which they are divisible, and give the particular history of one or more of the most remarkable species belonging to these respective groups, which will serve as a typical or characteristic example of its kind. In this way an opportunity will be afforded of explaining their principal modes of procedure; and even if it should so happen that any of our readers, who may consult these notices for information respecting his insect enemies, should not be able to identify any of the small moths in question from which he suffers with the species here described, he will seldom have any difficulty in discovering to which of them it is most nearly allied; and, by being thus enabled to gain some notion of its general history, he will be in a condition to determine what is likely to be the best mode of dealing with it.

The families into which these moths may be divided are three, viz.:—the *Tortricidæ*, the *Tineidæ* and the *Yponomeutidæ*. It may be remarked of them in general, that they are of small size;

the greater number indeed, extremely minute, especially in the second mentioned family. The majority of t are objects of great beauty when examined by a microscope, the ground colour being often very rich, and the wings ornamented with spots and bars of burnished gold and silver. "The great numbers, and size, and beauty of these moths," says that distinguished naturalist, Scopoli, "are truly marvellous. Nature seems to have lavished its wealth upon them more than upon other animals. Such is their appearance, that they are deserving of admiration more than words can express." Nearly all the modes of living exhibited by the moths already described are exemplified by this tribe, besides some others which are quite dissimilar. Such may be said to be the case with the Clothes Moths and some others, to the caterpillars of which, wool, feathers, hair, and other substances, which set at defiance the digestive powers of other animals, are well known to form a favourite repast, nay, to constitute their sole and appropriate food. Nearly all of what may be called our domestic moths belong to this section, especially those which cause so much trouble to the housewife by assailing carpets, woollen garments, and peltry of every description.

Of the first family, the *Tortricidæ*, a characteristic example has already been described in a former paper, namely, the *Tortrix viridana*, pea-green moth, which, by the curious manner in which it rolls up the leaves of the oak-tree, affords a very good instance of the peculiar habit from which this family derives its name. Various species of the genus *Lozotænia*, nearly related to the former, do the same thing with the leaves of a great variety of different trees and garden shrubs, some of them rolling the leaves, not from the apex backwards, as is generally the case, but from the sides inwards to the midrib, so that, by the operation, the leaf is made to resemble a scroll of paper. But we have never observed any of these moths in such numbers as to occasion material injury; and they do not, therefore, call for more particular notice in this place. It is stated, in regard to the *Lozotænia rosana*, however, that it occurs very plentifully in gardens in some parts of the country, and is very destructive to the flower-buds of the rose and currant bushes. It is a moth measuring about seven or eight lines between the tips of the wings; the latter broad, retuse, somewhat brick-red, with a streak at the base slightly arched, an oblique club-shaped band in the middle, and darker cross lines. The eggs are deposited in oval or circular patches of a green colour, either on the bushes or some object in the immediate vicinity; and the caterpillars are generally ready to commence their operations when the leaves are first expanding. They weave them together with silken threads into a kind of tent, in such a way as to prevent their

expansion, and feast in security on the enclosed flower-ich is soon reduced to such a condition that the petals pable of unfolding.

w-winged Red-Bar, (*Ditula angustiora.*)—This moth, for-ferred to the genus *Tortrix*, is now distinguished by a name bearing allusion to the long and bifid crest which on the thorax. The species above named is one of a con-number of insects which injure the apricot, which it rolling the young leaves together, and destroying the fruit-buds before the flowers have expanded. The moth much in size, but seldom exceeds seven or eight lines the tips of the wings. Of the latter, the upper pair are narrow, and obtuse, of a smoky brick-red colour, with an brown streak at the base; a waved broader streak of the our rises from the anterior part of the wing, and extends ial angle; beyond this there is a short brown streak, n front, and narrowing behind; the hinder margin with le lines; under-wings dusky, nearly black. The inten-ie colours varies much, and they are generally deepest ale. It is supposed by Mr Westwood, who has investi-ie history of this moth, that the eggs are deposited in on the twigs, and that they are covered over by a glutin-, which hardens during the summer, and forms a protec-ing the winter to the eggs beneath, or to the young cater-n case they should be hatched early. The operations caterpillars first begin to shew themselves in the end of beginning of June, when the expanding leaves are tied at their extremities, there being generally a flower-bud ntre upon which the larvæ feed. The body of the cater-slender, about half an inch long when full grown, and of a owish-green colour; the extremity of the body pale yellow; l pale brownish-yellow, and scaly, as well as the first and g segments of the body, which are of a semicircular form, lack mark at each of the posterior angles; the eyes, the iate joint of the antennæ, and a spot on each side of the the head, black.* When it has attained its full size, the ar constructs a cocoon, by drawing the remnants of the ogether by means of slight threads, and occasionally shel-elf for the coming change by rolling up a green leaf, e manner of the *Tortrices* in general. The perfect insects ly appear in June or July. "The presence of the cater-says Mr Westwood, "may be easily detected by the l and gnawed appearance of the leaflets, which, when ill still cling together by many of the silken threads by

* Loudon's Gardener's Magazine, vol. xiv., p. 2.

which they are attached, and which are generally found about the twigs, with the withered petals of the adjacent blossoms. If these, therefore, be disturbed, we perceive the little caterpillar endeavouring to make its escape; and thus we are enabled to trace the injury to its source, and destroy, with very little trouble, the cause of the mischief: for not only does the removal of the dead leaves and petals ensure the destruction of the caterpillars, but the trees are thereby cleared from a mass of dead rubbish, trifling, it is true, in each single patch, but amounting, on a large apricot tree, to a quantity sufficient, if left on the tree, to harbour various creatures, which may subsequently be injurious to the leaves or fruit."

Apple or Codling Moth, (*Carpocapsa pomonella*,) *Phal. Tinea pomonella*, *Linn.*—Among the numerous enemies of the apple already recorded, another, and, in some parts of the country, a very formidable one, has to be added, pertaining to the tribe now under consideration. The caterpillar attacks the apple itself while in its progress to maturity, eats into the pulp, and finally consumes the seeds or pips, after which the fruit for the most part falls from the tree. The gardener is often surprised to see so many of his apples falling to the ground, even when the weather is calm, and, therefore, without apparent cause; but he will generally find, on opening them, that the heart has been consumed, and the further vegetative power completely destroyed. The cause of this, in most cases, is the moth in question. It appears in June and July, flying about chiefly in the evening, and in the day sitting on the trunks of the trees, or on the walls of the garden. It lays its eggs either between the leaves of the calyx, which now forms the crown of the fruit, or, according to Schmidberger, in the hollow part of the fruit at the end of the stalk: probably both these places are occasionally made their receptacle. Immediately on being hatched, the caterpillar penetrates into the pulp of the apple, which, by this time, has grown to a considerable size, (the codling, which the insect principally attacks, being an early apple,) where it finds ample means of sustenance till it attains its full growth. "At first," says an anonymous writer on this insect, who appears to have watched its proceedings closely, "it makes but slow progress, being little bigger than a thread, but after a fortnight, its size and its operations have much increased. It has now eaten half-way down the apple, and the position of the hole at the top, if the apple continue upright, or nearly so, is inconvenient for a purp[illegible] it has up to this time been used for—that is, as a pass to ge[illegible] of its little pellets of excrement, which are something like fir[illegible]-dust or coarse sand; another communi[illegible]ion with the out[illegible]r is therefore required, and it must be so [illegible] the power of gravity to assist in keeping

[t is accordingly made directly downwards towards
'f the apple which is lowest, and thus the trouble of
ne pellets upwards through the eye of the apple is
a constant admission given to a supply of air without
The hole now made is not, however, sufficiently open
rver to gain by its means any knowledge of what is
ithin; this is only to be obtained by cutting open a
he apples as they gradually advance to ripeness. The
ever, very easily seen, from its always having adher-
on the outside, an accumulation of the little grains
been thrust through. Having completed this work,
turns towards the centre of the apple, where he feeds
When within a few days of being full fed, he, for
ne, enters the core through a round hole, gnawed in
orny substance which always separates the pips from
the fruit, and the destroyer now finds himself in
us chamber which codlings, in particular, always have
ntre. From this time he eats only the pips, never
ng the more common pulp which hitherto had satisfied
nisticated palate; and now nothing less than the
oured aromatic kernels will suit his tooth, and on
few days, he feasts in luxury."* This larva is of a
colour, with a brown head; very similar, in fact, to
caterpillars of the *Tortricidæ*, which it is often im-
distinguish while in that stage of their existence.
nsumed the internal substance of the apple, as above
the fruit commonly drops from the tree, carrying its
ng with it; the latter then makes its escape by the
reviously made; creeps about till it finds a suitable
ts further changes, which is commonly a fissure in the
ie stems of fruit-trees, and then becomes a chrysa-
d in an oval cocoon of beautiful milk-white silk. In
it passes the winter and early spring. The moth is
e-quarters of an inch in expanse; anterior wings ashy-
h numerous darker transverse streaks, united into a
band towards the base; on the anal angle there is a
somewhat eye-shaped spot, the margins of which are
reddish golden colour; hinder-wings black, darkest

h the caterpillars are often so abundant and destruc-
ıme thing happens here as in many other similar cases,
oth is comparatively seldom seen. It has been sug-
t burning weeds in gardens about the season when the
ear may have the effect of driving them away. It is an
pedient to collect the fallen apples, and that as speedily

* Entomological Magazine, vol. i., p. 145.

as possible after they have fallen, and, either by pressure or by throwing them into warm water, destroy the larvae. It is also advisable to examine the bark of the trees in winter, and to clear them of the loose and partially detached portions which harbour so many noxious insects. When the caterpillar has taken up its abode within the fruit, it is perhaps impossible, on large trees especially, to do anything to check its operations; dwarf trees, however, may be examined, and the damaged apples ought to be immediately removed. It is stated that, on the Continent, this moth sometimes lives on pear-trees; but this, as far as we know, has not been ascertained to be the case in Britain.

The Wœberian Moth, (*Carpocapsa Wœberiana.*)—This moth has long attracted the attention of horticulturists, and the first account of it was given many years ago by Mr Spence, the distinguished coadjutor of Kirby, in the famous Introduction to Entomology, in a letter to Sir Joseph Banks, published in the Transactions of the Horticultural Society of London, vol. ii. p. 25. It is one of the smallest of its tribe, the wings seldom expanding above half an inch; the markings, when carefully examined, are found to be very beautiful. The upper wings are obliquely streaked with golden colour, silver, and brown; near the posterior angle there is an indistinctly formed eye-like spot, faintly bordered with golden, and marked with lines instead of a pupil, the fringes appearing golden in certain lights. The under-wings are deep brown or black. The eggs are described by Mr Spence as flat below and convex above, smooth, pale-red in the middle, with a white apparently membranous margin. They are laid on the bark of various kinds of fruit-trees. The caterpillar which issues from them feeds on the inner bark of these trees, and when they are at all numerous, the injury done to the tree is very considerable. They generate canker and other diseases; cause the sap to escape, produce exudation of gum, and, after rendering the tree for a long period very unsightly and unhealthy, frequently in the end destroy it altogether. The caterpillar is about four and a-half lines in length, of a white colour, and nearly semi-transparent. It lives for about a year, and all that time it remains under the bark, feeding on the alburnum. There are two generations of them in one year on the Continent, and this is probably the case here also. The pupa is brown, and lies in the perforation made by the larva. In order to allow the moth to escape, it works itself outwards with a screw-like motion to the extremity of the hole, where a portion of it may be seen to project after the moth has got free.

"Although their attack upon bark and alburnum," says Mr Spence, "should not at first be extensively injurious, the admis-sion of water into their [illegible] cells, and frequent repetition of the

', must, in the end, cause rottenness; and it is, perhaps, probable that to these insects should be often primarily ed the canker laid to the charge of the soil or the mode ation. To check the evil, the first and most essential is to cut away the edges of the canker where the insects fly found, making the wound smooth, and covering it y composition which is likely to prevent the moth from ng her eggs there again. One precaution is necessary; nto boiling water, or bury at a considerable depth, the pieces of decayed bark containing the larvæ. When æ are found to have insinuated themselves generally into gh bark of old trees, it would probably be advisable to Ir Knight's judicious recommendation, and scrape off the f the lifeless bark, and such portions of the alburnum as ıred—a process which, there can be no doubt, would be geous to the tree in other respects, as pointed out by ght."

recommended also, by other writers, as a method of pre- the moth from laying her eggs on the tree, and the cater- om entering the bark, that the stem should be washed olution of lime, about the end of May, and again in Sep- It is also of great use to brush the tree with a hand- bout this time of the year; as, by this means, the small ıt visible to the naked eye, are brushed away.

Bergmann Rose Moth, (*Argyrotoza Bergmanniana*,) *Dono- rit. Ins.*, vol. v., pl. 157, f. 1-6.—The rose-bush is more nfested with particular insects in almost all its different Certain saw-flies bore the wood, and make it a receptacle : eggs; leaf-cutter bees (as has formerly been described) rounded pieces from the leaves; small moths of various ine the leaves, and form tortuous galleries within them; cluster about the uppermost branches and flower stalks, ract the juices by which the flower should be nourished; ally, a variety of moths belonging to this family take up ode within the rose-bud itself, and either completely pre- : petals from expanding or disfigure them in such a way : beauty of the flower is entirely lost. On examining to- ne 8th) the Rosarium of the Edinburgh Botanic Garden, ix different caterpillars of moths were found actively at nd not only making sad havoc among the foliage, but ng and damaging multitudes of the largest and most ıg flower-buds. Of one of the most plentiful and active : we now proceed to give a brief history, from which a orrect opinion may be formed of the proceedings of the se-bud moths. *A. Bergmanniana* is a beautiful little moth, y found plentifully in gardens in the end of July and be- of August. It is thus described in Stephens' Illustra-

tions of British Entomology:—"Anterior wings yellow, clouded with fulvous, and obscurely reticulated with the same, with four slightly curved, nearly equidistant, streaks of silvery dots; the first abbreviated and near the base; the second before the middle; the next rather behind, extending obliquely to the anal angle; and the fourth on the hinder margin itself; cilia pale yellow; posterior fuscous with dirty yellow cilia; head and thorax sulphur yellow." The eggs are laid upon the branches, frequently near the axillæ and base of the young twigs, where they are likely to be best sheltered from accident, a precaution the more needful, as they pass the winter in this situation. About the beginning of June, the operations of the caterpillar commonly shew themselves, and we may then observe that where two or three leaves naturally approximate to each other, the caterpillar has taken advantage of the circumstance, and bound them together with silken threads. Mr Westwood says that it often selects the leaves upon a single stem while yet young, and these it contrives to fasten together, back by back, before they are expanded, giving the packet the appearance of a fan folded up.* These packets of leaves the insects pierces through and through, feeding upon them in its progress. Often, too, the long calyx leaves, or some of the common leaves that happened to be nearest it, are fastened down over a young bud, and the latter is, of course, perforated and gnawed along with the leaves. The caterpillar, which is thick and fleshy, is of a dark flesh-colour; the head black and shining; the first segments with two black patches on the upper side; the two following segments spotted with brown; pectoral legs black. It is about three and a-half or four lines in length. It changes into a chrysalis either in the interior of one of its leaf-packets, or it curls up the edge of a leaf like the other *Tortrices*, and then forms a bed of silk. The chrysalis is of a shining reddish-brown, the back with transverse rows of serrated teeth, and the caudal extremity terminating in two small hooks.

It is extremely difficult to guard against the injurious operations of this and similar moths. Even though the perfect insects were caught in numbers and destroyed in any particular garden or locality, it is very likely that others would soon arrive from other quarters to supply their place. Perhaps the best method, in particular when any favourite rose-bush is infested, is to have recourse to hand-picking.

Bud-Tortrix of the Pine, (*Argyrolepia Turionella.*)—To the numerous enemies of the pine tribe already noticed, additions are still to be made from the present family, particularly in the species just named, and its near relative, *Cnephasia Resinella*, both of which demand a brief notice. The female of the former species

* Loudon's Gardeners' Magazine, vol. xiii., p. 387.

gs on the buds of young fir-trees, (particularly of the placing them near the apex of the bud; and the cater- exclusively on the bud. As they increase in size, they lownwards, and excavate the whole heart of the bud, mpletely check its growth. In the hollow space thus caterpillar spends the winter, entering upon the pupa following spring, and appearing as a moth in June, igust. The moth commonly sits during the day on the ees, and is not easily observed owing to its resemblance the bark. The head and back are pale rusty-red; s rusty-red, variable in the depth of the tint—crossed is narrow stripes of pale blue or greyish-white, having stre; near the base are a few insulated spots of the r; fringes white—under-wings of the male whitish- r towards the fringes, which are also white. Under- female dark grey throughout. Abdomen, antennæ, and -expanse of the wings seven or eight lines. When full- larvæ are brownish-red, with darker transverse rings, g brown head. "If the trees," says Kollar, "are not ed by this insect, they are at least injured in their wth, particularly when the heart-bud of the leading h forms the continuation of the stem, is destroyed. It be perceived that this insect is one of the principal e crooked growth which is observed in the branches . Nothing more can be done towards the destruc- insect than destroying the turpentine tumours, par- out the end of October, while the caterpillars are in tting off and burning every shoot infected with them. method may be avoided and the shoot saved, if the bercle is destroyed before the caterpillar penetrates nto the alburnum of the tree."*

ne Moth, (*Cnephasia resinella*.)—The appearance of similar to that of the foregoing, and, unless closely ey may be confounded with each other. The upper k brown; the back with longitudinal silvery lines, approximating spots; wings traversed with lines of a ir than the ground, and of a metallic lustre; under- black, with a yellow and brownish line just within the lerside wholly light greyish-brown; expanse of wings lines. The moth appears early, in May or June at ays her eggs on the young shoots of the fir; the larva o the alburnum, causing the sap to flow, which gradu- into an excrescence and hardens in the air. The nsequence of this treatment is, that the upper portion withers, and, if the lower part retains its vitality, it

* ise on Insects Injurious to Gardeners, &c. Loud. Trans. 353.

only throws out lateral shoots on the following y . The colour of the caterpillar is ochre-yellow; the head br , and shining. When touched, or desirous of changing its place, it lets itself drop from the branch, spinning, at the same time, a thread, by which it gradually lets itself down or continues suspended; and it can draw itself up again, by the same means, to its former place. The pupæ are described as being very delicate, withering up if taken out of their hiding place and exposed to the air.

The *Teneidæ*, the second family of this tribe that claims our notice, is composed of the species which were included by Linnæus in his extensive and comprehensive genus *Tineæ*, as well as of some others which he classed with the ***Pyralides***. They are the smallest members of this tribe, and the appearance of many of them is familiar to us from occurring so plentifully in houses. They possess four palpi, which are usually distinct, and not concealed by hairs or scales. The upper-wings are long and narrow, assuming, when closed, the form of a rounded ridge, as if they had been moulded on the body; sometimes they incline on each side of the body, almost perpendicularly, and are often elevated at the hinder extremity, like a cock's tail. The under-wings are ample, and commonly plaited. The caterpillars are smooth, or nearly so, provided with sixteen feet, and live in habitations of their own construction, some of which are fixed, and others are carried about by the insect, in the same manner as a snail carries its shell. The substances of which these dwellings are composed are generally the same as serve the insects for food, and the mode of their fabrication, which is often very curious, will be described in the following account of the respective species.

We have already had frequent occasion to allude to the benefits we receive from a tribe of insects which attack and destroy others of their own class, and are thus one of the most effectual means of thinning the ranks of the noxious species. The family now under consideration affords an example of an opposite kind, the insects they attack being of great utility to us. Two of them are found to be very injurious to bee-hives; they do not indeed directly kill the bees, but they consume their stores, destroy their works, and not unfrequently compel them to abandon their hives altogether. It may well excite surprise that so frail a creature should be able to gain such a victory over the armed and vigilant myrmidons of a bee republic; but they set about it in such a manner as almost to set opposition at defiance. The most common of these moths is named,

The Wax Moth, (*Galleria cereana*,) ***Phal. Geom. cereana*, Linn.** *Phal. Tin. mellonella*, *Donov. Brit. Ins.*, viii., pl. 283. ***Nat. Libr.***, *Bees*, pl. 8, fig. 2.—The moth is one of the largest of the family, the wings measuring about an inch when expanded, the [illegible] considerably larger than the male. In the latter the up-

ngs are short and obtuse, the hinder margin (that is, the margin when they are at rest) lunate or concave, the col- sky-grey, varying a good deal in the depth of the tint, whitish band from the base to the middle, spotted with the hinder margin with a series of brown streaks pro- from a line of spots; under-wings ash or brownish-grey, ges brown, with the extremity white; body yellowish- legs yellowish-grey with lighter spots. In the female per-wings are longer, straight, almost rectangular, the and scarcely distinguishable; the under-wings white, with grey border, and veins of the same colour; head and rk rusty-brown.

ourse it would be a somewhat perilous attempt for the approach the hive to lay her eggs when the bees are in a f full vigilance and activity. She therefore chooses her nity, and accomplishes her object, usually in the night, e bees are at rest. She commonly places them in some about the lower parts of the hive; but she even ventures s to enter the hive, and lay them among the combs. ver the caterpillar first sees the light, its instinct imme- leads it to the combs, among which it penetrates, forming galleries, which are lined with strong silk, so thick that gs of the bees cannot take effect through it. There is a e of opinion among apiarians as to what portion of the of the hive this intruder chiefly employs for food. Some at it confines itself to the wax; others, among whom is r, whose opinion is entitled to consideration, assert that rs neither the honey nor the wax, but the exuviæ of phs, and, very probably, the nymphs themselves. But, this may be, the devastation caused by these cater- when at all numerous, (and 300 have been found in a s speedily destructive to the prosperity of the hive: gradually give way to them, and ultimately are often d to quit the field altogether. When full-grown, the ar is about an inch long, of a dull white colour, with a ead, and covered with small brownish tubercles, from the f which springs a slender hair. They attain their full hree or four weeks after being hatched, when they pre- becoming pupæ, by weaving a very strong web, either in the tubes they had formerly excavated, or in some secure f the hive. On the Continent there are two broods in , but it does not appear whether this be likewise the case country. Here the moth is not nearly so plentiful as in ther parts of Europe. A nearly related species, *G.* , likewise occurs in Britain, but it is even scarcer than t described.

There is but one sure method of clearing the bee-hives of this moth, and this consists in looking for and destroying the larvæ and pupæ. If the hives are examined only once a week for this purpose, any traces of covered passages will easily be perceived, and must be immediately removed and destroyed with the caterpillars in them. The corners of the hive must also be closely examined, in case of cocoons being there, which must also be destroyed. A lighted candle has been also recommended to be held before the hole of the bee-hive, that the moth, flying out to the light, may be burned. But this is labour in vain, for the female does not leave the hive till she has laid her eggs; and it is only supernumerary males that perish in the flame.*

The genus *Tinea*, as now restricted, contains a considerable number of small moths, which are extremely troublesome in houses and granaries. As we cannot describe all these, we shall select a few of the most common that enjoy a bad eminence among their compeers; although, fortunately, the first mentioned is not nearly so injurious in this country as it is in most others. The genus *Tinea* may be known by having the inferior palpi scarcely projecting beyond the forehead; the probosis is very short, and formed of two small membranous and disjointed threads; and the head is furnished with a crest.

Corn-Moth, (*Tinea granella*.)—The length of this insect does not exceed half an inch; the wings, when laid over each other, slope at the sides, and the hinder part projects a little upwards. The upper-wings are nearly of the same breadth throughout, the ground-colour whitish, spotted with dark brown and dusky; the latter colour forms a distinct spot at the base, which is followed by a quadrangular mark on the outer or anterior border, and behind this there is a lengthened streak running nearly across the wings; fringe long, mottled with brown and white. The body is brown, variegated with white; the head with a thick tuft of white or yellowish-white hairs. The female does not differ from the male except in having a thicker body.

The history of this insect was first investigated by the celebrated microscopist, Leeuwenhoeck, by whom it was named th[illegible] Wolf, in consequence of its voracity; and it was afterward[illegible] described as British by Haworth, under the appellation of Mot[illegible]led Woollen Moth, which, however, may be regarded as a mis[illegible]nomer, as it never feeds on woollen cloth. It principally fre[illegible]quents granaries, where it has sometimes proved most destruc[illegible] [illegible]; but it has likewise been known to attack corn while still i[illegible] [illegible] The [illegible] so minute that they cannot well b[illegible] [illegible] magnifying-glass; each female lay[illegible]

* [illegible] Insects Injurious to Gardeners, &c., p. 78.

hirty or upwards, and one or two are attached to a single When the caterpillar comes forth, which it does in a ›rt time after the deposition of the egg, it immediately tes into the grain, closing up the opening by which it and lodging in the interior. Here it remains till the ıternal substance is consumed, and nothing left but the ıell; it then perforates the side and enters another 'epeating this as often as is necessary for a supply of it be full grown. The grains thus appropriated are all gether by a silken web, the interstices of which are filled excrement. Indeed, wherever the caterpillars move, ›gress can be traced by their webs; and when full grown ve the places where they fed, and run about over the vering it more or less with greyish-white webs. These ars, usually called the *corn* or *white worm*, are about half iong, and have sixteen feet; the colour of the body yelhite, that of the head brownish-red, the neck with two se brown stripes curved forwards. Their object in ultiəaving the grains which had afforded them at once food ter, is to seek out a convenient place for becoming pupæ. purpose they generally conceal themselves in cracks or in the floor or walls, and more especially in inequalities ɔof, which is usually in such a state in granaries as to nple facilities for so doing. The cocoon in which the ɪnveloped has mixed with it a number of small particles from the wood to which it is fixed. The larva, however, a long while shrouded in this covering in a dormant ore it is changed into a pupa; indeed this seldom takes ore spring; and, in three weeks after, the moth comes out. ıgh we are not aware that this insect is so abundant in this s to cause much apprehension, it may be well to be provided w suggestions as to the mode of treating it, in the posıt of its increase. Wherever there is a likelihood of its ɔe, it is a useful precaution to examine the floors, walls, of the granary, before the corn is placed in it, and these ould be either well swept with a hard brush or besom, aces most likely to harbour the chrysalis may be washed ıe strong solution, which would not only destroy these ut probably, also, other insects injurious to grain. This done only in the autumn and winter, as it is only at sons that the cocoons are tenanted. It has been parrecommended that the floor should be sprinkled with a ›f strong white-wine vinegar and salt before laying up When the caterpillars have fairly effected a lodgment ain, the best method of destroying them is to kiln-dry of 19° Reaumur is found to be sufficient to kil them.

Other methods must be adopted where t[illegible]s intended for seed, as the process of kiln-drying destroys [illegible]nating power. "As the surest method," says Kollar, "proved by repeated experiments, Dr Hammerschmidt recommends ventilators, by means of which an artificial cold will be generated in the places where the corn is to be laid up. He has observed that the larvæ of the corn-moth can live only in a temperature of from 10° to 12° of Reaumur. If it sinks to 6°, or only to 8° above zero, they become inactive, and even die if this low degree of heat be continued for any length of time. To attain this result, small windows should be made near the floors of the barns and lofts, and in all directions, by means of which a sufficient current of air will be preserved in these places."

The larvæ of these moths attack all kinds of grain, but are, perhaps, most hurtful to wheat. Another species, (*T. hordei*) occurring on the Continent, seems to confine itself principally to barley.

Clothes-Moth, (*Tinea tapetzella.*)—This well-known and pernicious moth measures about eight or nine lines between the tips of the wings; the upper pair are very dark brown, or nearly black, from the base to the middle, the space beyond that white, somewhat obscured with indistinct brown spots; hinder-wings ash-grey, the fringe long and silky; body and legs, black; head, white; antennæ, slender and bristle shaped, that is, tapering to the point. The caterpillar is white, with a brown head, and a few scattered hairs over the body; the abdominal legs very short and wart-like. The moth lays her eggs chiefly on woollen cloths, and it is from these that the caterpillars obtain both food and a covering for their bodies. The degree of skill and diligence which they shew in the fabrication of their mantle it would be more pleasing to contemplate if less frequently exercised to our disadvantage. This mantle or covering consists of a small somewhat cylindrical tube, open at both ends, and rather widest in the middle. The outer part, which is first formed, is a tissue of wool and silk, the latter spun by the caterpillar; but, when completed, the interior is lined with pure silk, for the greater comfort of the little tenant, whose body is soft and tender. So indispensable to its welfare is a fabric of this kind, that the caterpillar begins to weave it almost immediately after issuing from the egg. It moves forward either in a direct or tortuous line, shearing, with its sharp scissor-like mandibles, all the filaments of wool it meets with in its progress, applying the longer and coarser kinds to the exterior of its dwelling, and eating the shorter and finer, leaving a smooth path behind it. Often also it penetrates through the cloth, as if to ascertain which side is best adapted to its purposes. The growth of the body renders

ssary that the domicile should be occasionally enlarged : length and width. The former it readily accomplishes ing out its head from one end, collecting some wool, and rating it with the rest of the tissue; it then turns itself opposite direction, which the wideness of its tube in the enables it to do with facility, and repeats the same operathe other extremity. The widening of the tube is a more task, and the plan which it adopts to accomplish it is as ts as if it were the result of a process of reasoning. The vious method, and that which we would probably adopt a case, would be to make a rent the whole length of the ;, and again fill it up by inserting a new piece sufficient to he extension required. But such a proceeding on the part terpillar would expose its body for a time without adequate on—an accident of which it seems to have the utmost and guards against with every precaution. It accordkes the rent to extend only one half-way along, and, when ure is filled up, forms another at the opposite end. There erally two fissures made in each half, the one being oppoother, so that the widening of the tube is effected by the n of four separate pieces. The colour of the garment is ily the same as that of the cloth which affords the matel, if the latter be party coloured, it exhibits a correspondety of hues.

l at once be seen how destructive these operations must ily be to the cloth on which they take place. Where not perforated, the abraded portions speedily break out into the slightest pressure, while the appearance of the cloth letely destroyed.

Moth, or Single Spotted Woollen, (Tinea pellionella.)—ry common moth is somewhat less than the preceding, ng about half an inch between the tips of the wings when d. The upper-wings are silvery-grey, with one or two oints on each; under-wings light silvery-grey, with long The caterpillar is like that of *T. tapetzella*, but it comives on furs; and unless great care is bestowed on the of such articles, they are almost certain to be attacked, edily injured or destroyed. It forms a kind of felted case el, partly within the substance of the skin, and the hairs wed off near the roots. These caterpillars move about e place to another with considerable speed, so that their s soon ramify in numerous directions, and a few of them long in inflicting irreparable injury on a piece of peltry.

Destructive Tinea, (T. destructor.)—Nearly the size of ceding; upper-wings of a yellowish-brick colour, without under-wings ash-grey, tinged with yellowish-brick colour;

the fringes nearly of the same colour as the wings; forehead tawny. This species frequents museums, attacking almost all kinds of preserved specimens of objects in natural history, and adding greatly to the difficulty of keeping them in good condition.

These must serve as examples of this genus of moths which contains, as occurring in Britain alone, no fewer than sixteen or seventeen species. Although each of these lives and feeds on some particular substance in preference to others, yet most of them take a pretty wide range in this respect, and the same species which destroys woollen garments may also be found in skins. They sometimes appear under circumstances where it is extremely difficult to account for their having obtained access, so as not to render it surprising that the belief should be so general, that they are bred or generated (that is to say, spontaneously) in the substances where they are found. This notion, however, cannot for a moment be entertained; and any object liable to their attacks, such as a piece of fur, if so firmly closed up that the parent moths cannot find an entrance, will remain in perfect security, unless it so happen that the germ of the mischief has been closed up along with it. We cannot, in this place, enter at any length into the consideration of the methods of guarding against these assailants, or of destroying them after they have obtained a settlement. Exposure to a considerable degree of dry heat, wherever that is practicable, is the easiest and most effectual mode of destroying the eggs and larvæ. Immersion in boiling water is, of course, equally effectual. The objects preserved in museums are protected from moths, as well as other destructive insects, in various ways. Corrosive sublimate, dissolved in spirits of wine, has been a good deal used of late, and is said to be very efficacious. Spirits of turpentine, oil of petrolium, and camphor, although, perhaps, they do not actually kill the noxious insects, are yet very useful in driving them away. A preparation which speedily kills them, and which is said to be the best possible preservative, is that called Becœur's soap, which consists of the following ingredients in the proportions indicated:—

[illegible]	. . . 2 lbs.
White Soap	. . . . 2 lbs.
[illegible]	. . . . 12 oz.
[illegible]	. . . . 4 oz.

Sulphur[illegible] fumigations have long been used with advantage, [illegible] must be employed with caution, as they are apt to injure the [illegible] objec[illegible]

THE FARMERS' NOTE-BOOK.—NO. V.

Cure for the Distemper in Cattle. By the EARL of ESSEX. cannot resist giving a receipt for the treatment of beasts may take the prevalent distemper. It shewed itself last er in one of my yard-stock, by its discharging abundant a from the mouth, with sore and inflamed tongue and gums, dull, no appetite, confined bowels, and very hot horns. sired the bailiff to give him one-half pint of the spirit of turine, with one pint linseed oil: repeating the oil in twenty-hours, and again repeating it according to the state of the uations. At the end of twenty-four hours more, the bowels having been well moved, I repeated both turpentine and oil. wo days the beast shewed symptoms of amendment, and in e or four took to his food again, and did perfectly well. All yard beasts, and two of the fattening beasts, have had it, (five rs I had sent to London before the disease appeared,) and lave been treated in the same manner with perfect success. ' a pint of turpentine is the smallest, and one pint the est, doze during three or four days. Little food, besides oat-l gruel, was given.

emarks on Mr Brown's Statement regarding Malthus' Theory.— W. K. Brown,* in his anxiety to demolish the "Malthusian hypois" in regard to the increase of population, has, I apprehend, le a strange mistake as to the exact nature of that hypothesis. thus, I believe, maintained simply that population, if unchecked, various causes, which he pointed out, would double itself every nty-five years; thus increasing in geometrical progression by ommon ratio of two at these successive intervals. Now, ough Mr Brown has himself correctly stated "the first prine of the Malthusian hypothesis" to be, "that every twenty-years *population* multiplies in the ratio of 1, 2, 4, 8," 408,) he has evidently assumed it to be that the *ratio* of ease thus multiplies. Malthus assumed a ratio of increase h is simple and unvarying throughout, acting in geometrical gression on the amount of population; while Mr Brown ies that he assumed "a compound ratio of increase," the o, not the *population* simply, doubling in geometrical prosion, and to be applied strangely enough to the amount of ulation by a sort of arithmetical progression at the end of y ten years. Acting on this notion, he has made his calcuat page 411 on the population of England and Wales, cording to the hypothesis of Mr Malthus," shewing that the ease for ten years, from 1821 to 1831, would be at the rate

* Farmers' Note-Book.—No. IV. Journal for March 1844.

of twenty-four per cent. only, while, from 1841 to 1851, it would be at the rate of sixty per cent., and, from 1851 to 1861, at the rate of 108 per cent.! whereas, it is quite clear that, according to Malthus' hypothesis, as he himself has stated it, the unchecked rate of increase would be a constant and unvarying one, and, if taken for any given period of ten years on the population at the commencement of that period, would be about thirty-two per cent. I believe that Mr Malthus under-estimated the power of increase of agricultural production; and some of Mr Brown's statements are interesting, because they shew that the checks on population have also, on the other hand, operated powerfully in Great Britain, and still continue to operate with increasing force: but a writer on statistics, of all men, should be careful not to assume incorrect data as the basis of his calculations, more especially while attempting to prove by them the fallacy of his opponent's arguments.

A calculation of the Population in England in 1861, *and of the Territorial surface as the source of sustenance, estimated upon the state of Population from* 1791 *to* 1841, submitted to Sir Robert Peel, Bart. and the Chancellor of the Exchequer, on the 24th May 1844.—By Mr William Keer Brown, Folkestone.

Acres of land cultivated and uncultivated in 1791,	32,342,400
Population estimated	7,500,000

Four acres and a fraction for each person, including maintenance of horses.

Acres of land rated or cultivated in 1841, .	30,000,000
Uncultivated, ...	2,342,400
	32,342,400
Population, ...	15,000,000

Two acres and a fraction for each individual, including maintenance of horses.

The population returns from 1831 to 1841, give an increase of population in ten years, in England, of 2,000,000, or about [illegible]3,000,000 in 1831. The same increase going on to 1851 (or [illegible]even years to come) will make at that period—

Populatio[illegible] England in 184[illegible] . . .	15,000,000
[illegible]ncrease fro[illegible] to 1851 . . .	2,000,000
Pop[illegible] 185[illegible] . .	17,000,000
[illegible] from 1851 .	2,000,000
[illegible] .	19,000,000

gh the Malthusian hypothesis of a certain rapid increase lation, every twenty-five years, over means of subsistence, ved an entire fallacy, yet the actual increase requires ve circumspection of the highest order to countervail; 861 (only seventeen years hence) an increase of 4,000,000 will take place in England according to the ratio of in- f population by the census of 1841, (from 1831 to 1841,) g 8,000,000 of acres of surface, at two acres each person, enance, whilst all that remains in England is 2,342,400 ' uncultivated land to meet the demand, so far as terri- ırface is concerned.

plan for abolishing protection would then, in place of the emergency, (throwing, as it would, a large quan- oil out of arable cultivation, by letting the foreigner un- r into the British corn market,) increase in place of less- ıe difficulty in a national point of view.

ıendently of the general or national concern in the pro- for abolishing protection, there is gross injustice in the ar, or that which relates to the cultivator of the soil. having, by his capital and enterprise, so improved the t he is raising nearly as much produce upon *two* acres as was raised upon *four* in 1791, is clearly entitled to a ıd reasonable protection, in defence of such capital and se.

ınly legitimate means of meeting the exigency of increas- ılation, are by fostering the powers of the soil, and thus from the present cultivated extent *a greater quantity of* —the cultivation of remaining wastes and commons—and, ll, an enlarged and enlightened system of emigration and tion, as a means of enlarging the agricultural border of her country.*

ng Farm Horses. By Mr PETER BROWN of Linkwood, gin.—I observe, by the published list of the Highland and ural Society, that it is intended to give a premium of sovereigns for the best and approved account of experi- hewing the most economical mode of maintaining farm

pretty extensively engaged in agriculture; but much of and personal attention is taken up with other business, nders it impossible for me to enter on a course of expe- of any sort, with a certainty of being able to check them, ve the accuracy of their details; at the same time that I

* *Vide* Lord Bacon's Essay "On Plantations."

lament my own inability to undertake the duty, I am most anxious to have my mode of feeding farm horses fully tested, and with this view I shall shortly detail the mode by which I have fed and maintained from 12 to 20 horses for the last twenty-five years.

In the first place, I shall state that wheat, barley, oats, and pease-straw is the only fodder I have given my horses for the above period, and that their "feed" or "bait" has been all *prepared.*

I have, close to the stables, an apartment in which are placed a boiler of about 300 gallons content, and a steamer capable of steaming 20 bushels of potatoes. In the boiler I prepare a mixture of chaff, yellow turnips, and about a bushel of "lights," or dressings of barley, oats, or pease. The light grain and chaff are mixed after being carefully sifted, and put into the boiler layer about with turnips, (which, if large, are cut into three or four pieces,) along with about 50 gallons of water, making the boiler "bumper" full. When the steam begins to appear at the top of the boiler, a small quantity of salt is strewed on the top of the mixture, and by the time the steam ascends freely from the boiling substance, it is time to damp the fire, as it is found that the heat from below sufficiently prepares the upper layers, and that to continue the fire longer only wastes fuel and overdoes the bottom portion of the mixture. When the heat has so far subsided as to allow a person to remove the mixture without inconvenience, it is thrown into a cooler placed close to the boiler, and is given to the horses at the rate of a common stable pailful each, twice a-day, when they are working short time, and thrice a-day when working long time. In this way I feed my horses from the first of October till about the middle or latter end of April, by which time the spring corns are generally all thrashed out, and the "lights" or dressings accruing from them exhausted. From that time I substitute steamed potatoes for the mixture—these I carefully wash before putting into the steamer, and to them I also give a little salt during the steaming operation. They are also given twice and thrice a-day in the [illegible] quantities as the mixed food. The potatoes I steam every [illegible] if kept over night, they become glutinous and indigestible [illegible] dangerous to give to horses in such quantities as I have [illegible]ed, but if used fresh steamed they may be given in any quantity. The steamer has a false bottom through which the liquid or juice from the potatoes is drained off, and the potatoes [illegible] thus prepared, are as dry, clean, and mealy, as those [illegible] able. I find them excellent food for horses [illegible] would prefer them to any other feed

potatoes are a bad cleaning crop, and don't suit my rotation:
e I grow but few of them, but manage to have a sufficient
ly to carry on my working stock from the middle or latter
of April till the 1st of July, when I have fulness of grass for
r pasturing or soiling my horses till the 1st of October.
7 this means I have kept eleven horses on this farm for the
twenty-five years, and ten on a farm forty miles distant for
last seven years. I have wrought them hard at all sorts of
work, and they have had to perform frequent and long
ıeys on the road. They are in good condition at all times.
ve lost very few by disease, and they are generally lively and
ing like.

have never calculated correctly the expense of this mode of
taining horses, and cannot therefore speak as to that most
ıtial point farther than to observe that, by it, neither *hay* nor
etable grain is consumed, and that the saving on these two
material articles of farm produce, must do more than cover
expense of preparing the food, including the cost of fuel.
if this statement should, through this Journal, meet the
of any of the essayists who may feel inclined to experiment
write on the subject, perhaps they may think it worth while
otice the mode of feeding I have endeavoured to describe,
to test the economy of it by comparing it with others more
rally practised.

*lan for benefiting Turnpike Roads without the disadvantages
Broad Wheels.* By Mr WILLIAM BROWN, Kilmardinny.—In
ng along the turnpike road, it cannot fail to be observed
the carts conveying traffic have a uniform tendency to go
nes, every one following right behind another. The natural
t of this, it is obvious to remark, is to wear the road into
and cut it up in a very short time. In the winter season
when roads are under repair, and fresh metal is laid down,
e is a regular contest carried on between the carters and the
makers; the one, as diligently as possible, making smooth
es for the wheels of their carts, and the other endeavouring
l them up with metal as soon as formed.

order to remedy the evil of *rutting*, as well as to make the
s last considerably longer, I should propose the adoption of
an, which would yield all the advantages of broad wheels to
road, without subjecting the owners of the carts to their
tional weight and friction, further recommended by its great
licity, and of its being attended with no expense. It is to
oduce a variety into the *gauge* of cart-axles, and to take
sures to induce or compel the owners of carts to adopt it.
s, if a person is possessed of two, three, or four carts, let the

gauge of the wheels of each be four rent from the others, so that if we take five feet as t the narrowest, the next will be five feet four, the third five feet eight, and the fourth six feet; and let every one be subjected to double toll who does not get his carts made in this way. If a person has got one cart, he will choose his own gauge; if two, let there be at least four inches of difference, and so on with the third and the fourth; and if there be more than four, the rest may be duplicates of the others.

This plan could be adopted without materially affecting the size or construction of the carts, by having the wheels more or less dished, and more or less upright, adjusting the length of the axle thereto, as every practical wheelwright will at once perceive.

The effect upon the road of the working of a line of carts so constructed, would be, that a broader space would be smoothed down by the wheels of the carts, even supposing them to continue the practice of following one another. Thus three inches being taken as the breadth of the tire of the wheel of the first cart, each wheel of the three following has a difference of two inches, making six inches to add to the first three, or a space of nine inches under each side of the cart-track. Having such a broad smooth space under the narrow wheels would greatly lessen the tendency of carts to go right after each other, and the roads would be consolidated in a shorter time after being dressed with fresh metal—a process extending over three or four months of the year, during which a great part of the labour of the surface-men at that operation would be saved, and the whole road, being more equally worn, would last considerably longer, and be kept in repair at a smaller expense, and, in the end, would afford a reduction on the tolls. Statute labour on parish roads would be equally benefited, and the expense of maintaining them would also be materially reduced.

At present, the state of the roads almost imposes a necessity to have one uniform gauge for cart and carriage wheels, but that being done away, facility would be afforded for the employment of light carts and pony carts to the great convenience of the public. Another annoyance, when roads are under repair, arises from a line of carts taking possession of the smoothed portion of the road, even when it is not on their proper side, or it may be right in the centre, of which they keep possession with so much tenacity that more rapid conveyances have often great difficulty in getting past—that annoyance would also be greatly diminished. In short, the roads in the country would be brought more to resemble Macadamized streets in a town, along and across which carriages might freely move in all directions.

... made sufficiently plain the simplicit

advantages of this plan, I would conclude by earnestly ing it to the attention of road trustees, of lawyers, and tors, feeling assured that, if the two former of these gether, cannot succeed in extracting from existing the requisite power to induce or enforce its observance, r will, without much difficulty, be persuaded that it is y to grant it.

ulture of Flax as a Profitable Employment for Rural s in Scotland. By Mr ARCH. GORRIE, Annat Cottage, rthshire.—To whatever cause it may be ascribed, it is us that the market for rural labour has of late become ked.

years that are gone by, a slight competition existed farmers in engaging ploughmen at the feeing markets; armer that neglected to hire till near the Martinmas l to put up with the refuse of the market, for which he times to pay a higher price.

se days Midsummer was the feeing market day, to which undry resorted; and the effects of *treating* ploughmen n too apparent by the unlucky behaviour on the streets honest sons of toil. Indeed, Midsummer day was to grand jubilee day on which they were courted, and the uncontrolled liberty of having word about with their . But, as the demand began to slacken, the feeing ays were held later in the season—the tone of the honest n, which, even in their hey-day, never exceeded a coarse, ot ill-intended, joke, gradually became more subdued; al air of seriousness and sobriety was observed on the streets in the afternoon; and, if it was known that any ad not engaged his full complement of hands, he was eceive numerous applications by excellent ploughmen, n to dread the want of that employment to which they istomed, and which habit had rendered easy and agree- was painfully symptomatic of a decline in British agri- o hear these hardy and industrious men, on making ful applications for employment, declare, whatever were its, that now it was impossible, if they left a former mas- d another without the use of influence in their behalf; e higher districts particularly, many had to betake them- the precarious means of providing subsistence for them- d their families by what they termed "orra work," t any sort of work they might find. That matters have e to this with that useful class, is a painful truth which ttempt to deny.

to account for such a state of things would exceed the

limits of this communication. It may be more profitable to a
a few suggestions, shewing how capital may be invested in ex
ing employment for our rural population, with the certainty
fair return for such investment.

In days of yore, the spinning-wheel gave ample empl
ment to the female part of the population throughout Scotla
but steam-power has gradually, and now entirely, superseded t
sort of labour; and, hitherto, no substitute has been found
the female at a distance from the spinning-mill. Whilst
male population were regularly employed, this evil was not
in all its magnitude; but, now that both sexes have to mee
glutted labour market, if some remedy be not speedily fou
starvation must be the inevitable consequence.

In England and in Ireland, where poor-laws threaten to abs
a considerable proportion of the capital of the wealthy,
interest, aided by the far higher motives of humanity, has aro
ed the attention of the higher classes to the ways and me
that may be employed for ameliorating the condition of
labouring population by furnishing them with the means of ea
ing a livelihood.

In Scotland, some how, a spirit of laudable independence p
vades the labouring classes, and this very spirit has a tende
to conceal the real extent of suffering; for although hitherto
wealthy in England and in Ireland may have the start of t
class of our part of the island, it must not be inferred that t
are less alive to feel for the hardships of their fellow men, or
willing to relieve their sufferings; but the very circumstanc
the Caledonian peasant struggling to contend with privatio
secret, should stimulate the higher classes to redoubled en
now that the pinching economy of the English poor-house sy
in spite of all attempts at concealment, attracts general not

In other parts of the kingdom, the landlord and the fa
have united in associations for promoting the internal ind
of the country, and, after some experience, have found
the culture of flax is one means of paying our own spare lal
ers with that money which would otherwise find its way int
pockets of our not over grateful neighbours on the Continen

At their meetings it has been stated that £6,000,000 of Bi
gold are annually paid for the article of flax alone, besic
very considerable sum for oil cake, for the purpose of fe
cattle. Where raising of flax has in consequence been res
to, the announced profits have been higher than is u
derived from the culture of grain, besides the adva
to the community of the additional employment there
forded, in weeding, pulling, rippling, watering, sprea
taking up, tying up in bunches, rolling, scutching,

t in spinning; for it is found that as fine flax can be pro-
in this country as on the Continent, and it were a libel on
otch lasses to say that they could not, by practice, learn to
fine yarn as those in any other land.
it is objected that farmers in Scotland are prohibited by
ns of their leases from cultivating flax. Is it meant by this
ey are not so hostile to the practice as their landlords?
it be found by experience that a partial culture, or culture
nall scale, of this plant turns out to be beneficial to the
as well as to the community, will not Scotch landlords
uch probibitory clauses where they exist, and allow of a
percentage of land on any farm being laid under this crop
y? They will not surely be behind their brethren in Eng-
Ireland, who not only allow but encourage their tenantry
vate this useful plant. Oh, but, it is said, the culture of
l deteriorate the soil—this, however, is denied by some;
nting that it adds nothing to the dunghill, if, as is found
e case, it adds otherwise to the farmer's profits, are there
numerous substitutes for farm-yard dung to make up for a
ng crop on, say a fiftieth or even a hundredth part of a farm;
ve we not now skilful chemists able to direct us to
to the soil, by the many now available manures, those
ents of which the flax may be found to have robbed it?
uld not the oil cake, or, what is better, the crushed seed,
y be highly beneficial in the feeding byre, but also as an
r of the farm-yard manure?
is late climate, it may be objected that the working of
ld interfere with the labours of the harvest; but the very
oportion raised on every farm could give little hindrance.
x would be pulled before reaping commenced; and in the
me, the reapers found ample time to spread the lint on a
orning before the corn was dry for cutting. Where,
, it might be deemed advisable to ripen the seed, and
croach on harvest work, the crop is stooked, dried, and
with the seed, where it remains till spring, when labour
e, and when it is carefully thrashed, watered, and the
ecessary manipulations performed, at a time when labourers,
d female, would be otherwise idle.
very district of Scotland there is a great breadth of
ll lying waste, on which, by draining, fencing, and improv-
climate, by judiciously laid-of plantations, corn and flax
be profitably raised, and the pasturage improved; and
nts of land might be profitably let to small tenants,
canty pasture is now only afforded on bleak and exposed
nd hill-sides for half-starved sheep or cattle; and by both
eans, profitable employment might be much increased to

our redundant rural population, without forcing them to li the unhealthy atmosphere of the manufactory, or to aba their native land in pursuit of employment in our colonies labour market in which is already glutted.

These suggestions are submitted to the proprietary of land, who have the power, and who have always shewn th to promote the interests of the labouring class, when their tion has been directed to the subject.

Does the Rook Injure the Farmer or no?—Mr Hog of Ne has sent us a printed communication on a subject th merits of which are involved in the terms of the questio in the title of this article. The communication was pri private circulation, but at Mr Hog's request we willingl publicity. It is unnecessary to give here the entire corres contained in the communication, it being sufficient to sa planation, that it originated with fifty-four farmers and pro in a request to Mr Hog to allow means to be used to re very large rookery which exists at Newliston. Mr H reply to this request, to Mr Dickson, Wheatlands, on 7t 1844, states the most favourable case for the rooks; that account we give it almost entire:—

I ought earlier to have returned an answer to the letter which you j hands, signed by a large number of agriculturists, requesting me, as th of a very large rookery, to allow such means to be used as would, in a sure, reduce their number.

This letter being signed by so many for whom I have a great respe most of the farmers in this neighbourhood, and some at a great distance three or four proprietors of land, demands from me every attention, and endeavour to give to the subject of it.

Were I to tell you that the rooks had been here long before your tim —that I believe them to be much maligned and persecuted creatur there is said to be a fatality attending their expulsion from, or volunta of, a mansion—I know that you would say that I was the victim o and so we might laugh at one another, and, perhaps, should be less frie have been, and, I trust, are anxious to continue to be. But I am not take this way of it. I propose, in the first place, to shew you my ow dispassionately as I can, and then to lay the matter before a distinguis ist for his opinion, which, I trust, I may be at liberty to make public rather inclined to this course, because I observe that in other parts of t crusade has been commenced against the rooks—most people, I susp *fancies* as *facts*. To be accused of an offence, and to be accounted crim often held to be identical—those with *black* coats or *black* characters bei nounced guilty without a trial.

It is the result of my own deliberate conviction, formed from an o the habits of the bird from my earliest infancy, that the injury don farmer is of the most trifling nature. I believe it is a fact, in which a will confirm me, that the almost entire food of the rook is grubs and i they prefer these by much to grain of any kind—and that it is only whe ed by hunger that they attack this species of food. I think I may ca tion of every observing farmer to what all who have watched their hab noticed, that at seed-time they *follow* the harrows, picking up the wor dislodged from the broken clods, not *preceding* them, as they would

were their object *grain* instead of *grubs*. If you have not noticed this, let me request you to do so.

I believe that the rooks settle in a country only where the grubs—their natural food—abound, in conjunction, of course, with trees of the requisite age for roosting on. I believe that their increase is limited by the supply of their natural food; and, therefore, that you could not eradicate or materially diminish the number of rooks, where they have settled, without being exposed to a host of unseen enemies, which, though seemingly insignificant, you could at no expense either diminish or extirpate—enemies which, multiplying in a ratio almost beyond our conception, might, unchecked, in a single season hopelessly devastate our fields. I have often heard that, in some parts of England, the rooks were eradicated at the instigation of the farmers; but that afterwards they sorely repented, and would gladly have suffered the *seen* inconvenience of the rook, in exchange for the *unseen* and irremediable destruction of the grub. I cannot, certainly, of my own knowledge, authenticate any such instance; but I intend to adopt means to procure any information that may be had on this subject. I strongly suspect that the small quantity of seed-corn which they destroy—and which, by the by, is, I believe, chiefly that which would be lost at any rate—or the injury which they may do to a potato plant newly sprung, (even adding the *boring* of the turnips in winter, which I hear sometimes complained of,) is a cheap payment by the farmer for the benefit which he receives from his black servants—a benefit, be it observed, which no human hand, at any expense, could accomplish for him.

I have heard farmers, even of a superior class, observe that rooks are destructive to young grass. I do not believe that they ever touched a root of it—they are digging for grubs. I had an overseer who shewed me where they had been pulling up newly-thinned turnips. It was on land lately broken up from old pasture, and, therefore, probably full of grubs. In the adjoining field, another season, the grubs actually destroyed a considerable proportion of my turnips. (I suppose the rooks had been kept off.) From this circumstance, and from observing also that the pulling up was confined to certain portions of the crop—while we have all seen immense breadths of turnips, in this neighbourhood, left quite untouched in this way—I feel quite persuaded, that in every such instance as that to which my attention was called, the rooks are only destroying a particular species of grub, that would certainly, if let alone, have destroyed the turnip.

I have been a farmer myself to a considerable extent for the last ten years. My fields lie nearer the rookery (with one exception) than those of any who have signed the letter, and I think I should know the damage done to crops. The result of my experience is, that, with the exception of an occasional shoot awanting in a potato-drill, I have suffered no injury whatever. I have had crops too thick and too heavy; I cannot say I ever had them too thin or too light. This last season I sold oats as high as L.15 per Scotch acre. Potatoes I have repeatedly sold at from L.15 to L.18. I have, therefore, some difficulty in comprehending how so many herds are required as you speak of, because I know that a boy, for two or three weeks, upon a very early sown field of corn, or at the potato springing, is all the expense I have been put to in self-defence.

But I believe some of you are willing enough to admit that there is benefit done by the rook. It is only the immoderate number that you complain of. Now, allow me to remind you of one or two things which you do not advert to. Rooks have their *breeding places*, and also their *winter quarters*, in which they congregate. This place is both the one and the other. But the number bred here bears but a very small proportion to the number you see assembled from the month of September to this time, attracted by the woods, and by the particular food, no doubt, which they principally require. So far as this is a breeding place I have a command over them, but no further. I cannot prevent the winter assembly from other rookeries, without cutting down my trees, and that, I am sure, you would not expect me to do. As far as those bred here are concerned, you know I have never protected them unreasonably. Every year I have appointed particular days, for various classes of my friends, when all that are to be seen out of the nests have been killed. One season there were ninety-four guns blazing in one day. The firing continued at least twelve hours, the shots going off during the thick of the day at the rate of twenty in a minute. You know I have always been glad to give a day to the farmers in the neighbour-

hood and their friends, which, with my own friends, on different days, at proper intervals, generally makes five or six days' hard shooting. I do not, of course, let every one come in. So near Edinburgh and the railway, that would be impossible. It is necessary to have certain rules, to prevent constant annoyance, and, let me add, to prevent the total destruction of those bred here.

But how am I to prevent the winter assembly, without, as I have said, cutting down all my trees. Even here I have done somewhat—I have cut down old timber to the value of L.2,500; and even this winter many a favourite tree of the rook is down. I really wish that the winter congregation were smaller. I think they injure the top branches by roosting on them; but how can I exercise any dominion over these by far the greater part of the colony?

Perhaps you are not aware of the immense distance the rooks travel of a morning. Looking at the number to be seen here wheeling about before night-fall, you would suppose them to breed a famine, (and, depend upon it, so they would, if they lived upon agricultural produce,) but there is not one of us who knows how far they disperse daily. A friend of mine, Mr Thomas Durham Weir of Boghead, who lives fully twelve miles to the westward, tells me that, soon after sunrise, he sees an immense flock come high over head from this quarter, and proceed, as far as he can see, in the direction of Kirk of Shotts. (You know there is no corn there! nor any vegetable production, to be injured.) How many go in all directions, and to what distance, (probably twenty or thirty miles,) none knows. I have often wondered what became of them, as, except at the breeding season, there is hardly one to be seen in this neighbourhood, unless in very bad weather.

* * *

I have lengthened out this letter perhaps unnecessarily and unprofitably; but I end, as I began, by saying, that where so many and so intelligent agriculturists direct attention to this subject, I have resolved to take the best advice I can get. I mean, for instance, to consult Mr Waterton of Walton Hall, Yorkshire, the best naturalist in the country—a gentleman who watches the habits of animals so minutely, that I believe he knows what they think; who has lived, as he himself says in the account of the nest of a particular species of waterfowl, as much in bogs as amongst books; who was enabled, by his accurate observation, to correct the mistakes even of professors of ornithology—and who, though I have not the pleasure of his acquaintance, will, I have no doubt, give us the benefit of his information on a subject which is now so universally occupying the attention of the farmer, and which ought to be fully investigated. Whatever his answer may be it shall be communicated to you.

We are not sure that any naturalist knows the habits of the *rook* better than an observant farmer, or even than a shrewd farm-overseer. At all events, Mr Waterton, in his reply to this letter of Mr Hog, leaves the satisfactory solution of the question asked him just where he found it.

Your communication to Mr Dickson is so much to the purpose, and contains [illegible]ch sound arguments, that I consider a report from myself would be nearly super[illegible]uous. However, at your request, I will enter into the subject; for I hold the [illegible]oks in great respect.

[illegible]e [illegible]e innumerable quantities of these birds in this part of Yorkshire, and we [illegible] [illegible]em our friends. They appear in thousands upon our grass-lands, and [illegible] [illegible]yriads of insects. After they have done their work in these enclosures, [illegible] baskets full of grass-plants, all injured at the root by the gnawing [illegible] the birds much for this; and we pronounce them most useful [illegible]nd our pastures. Whenever we see the rooks in our [illegible]urnip-fiel[illegible] our sorrow what is going on there. We are aware [illegible]hat grubs [illegible]urnips; and we hail with pleasure the arrival of the [illegible]oks, which [illegible] their dreaded progress. I have never seen the least [illegible]article of turn[illegible] turnip-top in the *craws* of the rooks, either young or old. If [illegible] Swedish turn[illegible]s in Scotland, they abstain from such food here; [illegible] may be taking insects at the time

that they are seen perforating the turnip. Dissection could set this doubt at rest for ever. No farmer in our neighbourhood complains that his Swedish turnips are injured by the rook. The services of the rook to our oak-trees are positively beyond estimation. I do believe, if it were not for this bird, all the young leaves on our oaks would be consumed by the cock-chafers. Whilst the ring-dove is devouring the heart-shoot of the rising clover in spring, you may see the rook devouring insects in the same field. The flesh of the rook is excellent. I consider it as good as that of pigeon. People in this part of the country will go any distance for a dozen of young rooks; even at the risk of a penalty for trespass.

* * * * *

The faults of the rook, in our imperfect eyes, are as follow:—It pulls up the young blade of corn, on its first appearance, in order to get at the seed grain still at the root of it. The petty pilfering lasts about three weeks; and during this period we hire a boy, at threepence a-day, sometimes sixpence, to scare the birds off. Some years we have no boy at all. Either way, the crops are apparently the same in quantity every year. In winter, the rook will attack the corn-stacks which have lost part of their thatch by a gale of wind. He is a slovenly farmer who does not repair the damaged roof immediately; and still we have farmers in Yorkshire of this description. The rook certainly is too fond of our walnuts: of course, it requires to be sharply looked after when the fruit is ripe. In breeding time, it will twist off the uppermost twigs of the English and Dutch elms, and sometimes those of the oak in which its nest is built, for the purpose of increasing it. This practice gives the tops of the trees an unsightly appearance, and may injure their growth in the course of time. Sycamores, beeches, firs, and ashes, escape in great measure the spoliation.

It ought to be generally known, that, in former times, the North American colonists having banished the grakles, (their rooks,) the insects ate up the whole of their grass; and the people were obliged to get their stock of hay from Pennsylvania and from England. And in the island of Bourbon, the poor eastern grakles disappeared under a similar persecution. The islanders suffered in their turn; for clouds of grasshoppers consumed every green blade; and the colonists were compelled to apply to Government for a fresh breed of grakles, and also for a law to protect them. Thus it appears, from history, that the sages of the East and the wise men of the West did wrong in destroying their grakles. They were severally punished for their temerity, by the loss of their crops. They repented, and repaired the damage; and, so far as I can learn, things have gone on well betwixt themselves and the grakles, and betwixt the grakles and the crops ever since. In 1824, I saw immense flocks of these birds in the low meadows of the Delaware.

I defend my sable friends, the rooks, here in England, on account of their services to the land. Should the adverse party effect their extirpation from Scotland, and then suffer by the ravages of the grub, I will, at any time, be happy to send you a fresh supply of these useful and interesting birds.

*Hannam on Waste Manures.**—Continuing to prosecute the subject to which his attention has been long directed, Mr Hannam, in this neat little volume, supplies us with the results of his more recent experience in regard to manures, combined with other matter, which, though previously before the public, it was necessary to include, in order to render the view of the subject more complete. A perusal of this useful treatise will, we think, be of great advantage to all connected with the cultivation of land, as it cannot fail to force upon them the conviction that a great deal more can be done in economizing manures than they have hitherto accomplished, and that many substances about a farm-steading,

* The Economy of Waste Manures, a Treatise on the Nature and Use of Neglected Fertilizers, by John Hannam. London: Longman. 1844.

and elsewhere, which are now allowed to run waste, or even to prove a nuisance to their neighbourhood, may easily be converted to the most useful purposes in the rearing of crops. By the term waste manures, the author means all those substances which, when applied to the soil, act beneficially upon the crop, and which are generally, or in many cases, neglected, that is, are either used for purposes for which they are of less value, or are completely wasted. In considering the economy of such substances, he arranges them under three heads, 1*st*, Waste Manures of the Farm; 2*d*, Waste Manures of Towns, &c.; 3*d*, Local Waste, that is, matters existing only in particular localities. Of the waste manures available on the farm, the *liquid* is the most important in quantity, including, as it does, drainage from the cattle-sheds, farm-yard, and house. As these consist chiefly of urine, which, according to Davy, contains the essential elements of vegetables in a state of solution, their value as fertilizers is obvious, and is, we suppose, generally understood.

Of the nature of "the refuse vegetable and animal matters of the farm," says Mr Hannam, "it is not necessary to enter into particulars. *Whatever has had life*, or what *contains the materials of which the living structure is composed*, will be useful to future life, and are manures which ought to be preserved. Hence, then, the various weeds, stubbles, grass, leaves, hedge bottoms, ditch and pond scouring, saw-dust, animal matters, &c. &c., which may be collected, are deserving of our attention. For instance, the weeds, grass, and vegetable remains contain in them the very matters future vegetables require. The animal matters, such as in flesh and blood, are extremely rich in nitrogen, carbonic acid, &c; and the soil, scourings, &c. often contain some decayed or decaying vegetable or animal matter; and when they do not, they have in them some of the inorganic matters of plants; and, even if deficient in both organic and useful inorganic food of plants, they may be employed as absorbants for liquid manures, for admixture with animal or other highly azotized substances, (which are apt to ferment too rapidly,) or with such as are too potent in their action to be used without being reduced. But it is for the purpose of making compost with liquid and other fertilizing matters, that even the vegetable substances are most useful. Many of the vegetables contain much more nitrogen than the straw of grain, and are also peculiarly rich in the inorganic matters, especially the saline; they, therefore, give the farmer the means of increasing his manure heap greatly, as they are, in every point of view, capable of being made into as good compost as that which is generally formed in the yard. To do this, they must, however, be subjected to the same process—mixed with the dung and urine from the cattle, and properly fermented. Saturated with the liquid drainings, they form a manure of no inconsiderable value.—P. 3[illegible]

A[illegible] the value of such refuse matters, [illegible]where, on a farm of 200 acres, the [illegible] supply of manure by 200 loads, [illegible] extra supply of four loads per acre [illegible]d also a heap of excellent manure [illegible]h and other weeds, by saturating [illegible] during summer. The author [illegible], from *house drainings alone*, in compost with [illegible] matters, thirty loads of valuable manure. The stu[illegible]m a pea-field, saw-dust, &c., he adds, are [illegible] process, and form the nucleus of [illegible] considerable stock of manure.

In order to shew our author's plan for properly economizing the waste manure of every farm—that is, to enable the farmer not only to preserve the fertilizers which are usually wasted, and to concentrate them in the form of compost or otherwise, at pleasure, but also to make and to preserve this compost for any length of time, in whichever condition he may think fit—we cannot do better than extract the following suggestions, which he regards as adequate for accomplishing these desirable purposes:—

1st, Let all the buildings round the farm-yard and straw-folds be spouted, and the delivering tubes so arranged that the water may be made to flow into the yard or not at the option of the farmer. This may be effected by bringing the end of the spout over a drain, which may be left open or close, as he may wish the water to escape from the yard or not. 2d, Let the farm-yard, if possible, be made slightly concave, so that the liquid may permeate the mass, and make to the centre. 3d, Make drains from every stable, cow-shed, &c., and from the kitchen, into the manure-yard. 4th, Select a shady place, if possible, on the north side of a hedge or wall, where it is convenient to cart the manure to, when it is removed, during winter and spring, from the fold. Mark out a surface sufficiently large to hold in a heap all the manure made during winter, and form a compost couch of this size, and two feet deep. Divide this couch into three sections, by two rows of flags or bricks. Make the bottom of each couch incline, so that the liquid from the manure may gradually fall to the front side. 5th, Next cut a drain alongside, and in front of the couch, and connect it with the drain which runs alongside the couch, so that the liquid from the couch may run into the tank. 7th, Make a drain from the bottom of the farm-yard into the tank, and fix a sluice, so that the liquid from the yard may be let into the tank or not, at pleasure. 8th, Fix a pump over the tank, and connect the nozzle with a wooden spout, placed so as to traverse above each division of the couch. 9th, Bore a hole through the spout over each section of the couch. In each hole put a plug, on the topside of the spout. Also, over each hole affix, on the underside of the spout, a leathern nozzle or delivering tube, two or three feet long; by means of which arrangements the liquid from the tank may be directed to any part of the couch.

Into the subject of the waste manures of towns, &c., as well as what our author calls *local waste*, we cannot enter at present; but what he has written regarding these matters will well repay perusal, as he supplies not only a great number of useful statistical facts, but furnishes valuable suggestions as to the inferences to be derived from these facts, and the benefits which may be obtained by a judicious use of many highly fertilizing substances which are now permitted, if we may venture to make his own application of the well-known line,

"To waste their *sweetness* on the desert air."

He concludes his treatise in these words:—

It has been shewn that, by a proper economy of manures which are now wasted or neglected, we may increase the production and decrease the cost of food; that our farms, our towns, and particular localities, are sources from which an abundance of these manures may be obtained; and that they have been made use of, in some cases, with eminent success, and may, by the proper use of means, be employed in other cases with equally beneficial results. It remains, therefore, for us to hope that the suggestions which have now been offered on their economy, may not be altogether fruitless, but that the same energy of spirit which induces the agriculturist to explore the caves of India and the battle-fields of Europe, the coasts of Africa

and the islands of the Pacific, for the elements of fertility, and which carries the manufacturer to the plains of Saxony and Australia for the materials of our garments, will lead us to cultivate our own resources, and to make use of the vast stores which we possess of the *raw material* of the bread of the people.

*Hutchinson on the Practical Drainage of Land.**—Since the necessity of draining became one of the first and most important elements in the agriculturist's creed, there has been no want of published information as to the most effectual and economical mode of accomplishing it. Many useful treatises have appeared, in which the true principles of draining are judiciously expounded, and an adequate acquaintance shewn with those collateral branches of knowledge which are calculated to throw light upon them. Other writers, again, have taken up the subject without having much information to impart in addition to what was previously well known, in the hope, probably, that, by becoming authors, they may promote their professional interests as land-agents or valuators, or in some similar capacity. We do not know in which of these categories the public will be inclined to place Mr Hutchinson's treatise. In perusing it, we confess that we have not detected much which might constrain to its publication under a sense of materially benefiting the agricultural interest. The author, however, is of a different opinion. "The fundamental principles of draining," he assures us, "have not been clearly shewn by any writer up to the present time; it remains for the author, as a practical drainer, to lay before the public his plan, which he considers will secure to all parties the advantages of proper and effectual draining. It is not the author's desire of literary fame that induces him to send his ideas into the world, but a wish to benefit the public at large." The work is dedicated to Prince Albert, who, we are told, assisted the author in bringing it forth.

The laudable object of the author, as he himself states, being to make himself as plain and distinct in his statements as he possibly can, so that he may be understood by those to whom *it* is addressed, he calls upon practical agriculturists to overlook his blunders, if he does not succeed in giving grammatical statements of the various modes, ways, and carrying out of the work. It is much to be desiderated that some more care has been bestowed upon the composition, for the absence of the qualities here alluded to, which the author seems to suppose would have the effect of rendering his work more simple and easily understood, it is scarcely necessary to say, have an entirely opposite effect.

* A Treatise on the Practical Drainage of Land. By Henry Hutchinson, Land-Agent, Valuer, and Professor of Draining, Walcot, near Stamford. London: Houlton and Stoneman, 65, Paternoster Row. 1844.

Ve have seen works on such subjects as draining written with considerable degree of elegance: this is, indeed, not necesary; but perspicuity is indispensable. Here we not unfreuently meet with such writing as the following:—

When you have discovered what kind of water you have to contend with, or your ind is subject to, the next is the mode of setting it out; and although it has been serted by many clever men, that none but a practical person can do this, nor he ithout a *level*, I have seen a great deal done of all descriptions *without a level at ll*, having no other, and no other required, but the level of the water. And I would emark here, it very seldom happens, unless it is for the purpose of ascertaining hether any and what fall has, or may be lost, in carrying the drain into execution, ut what the eye of a practical and experienced man will detect; but in this I shall ereafter shew a great deal depends, and will depend, upon the abilities of the man xecuting the work, &c.—P. 17.

The following passage is amusing, and we give it as such, as well s for the sound sentiment with which it closes:—

To those agents who, by good fortune, acquire the management of estates, and who have no experience but what they borrow from their friends, the author begs hem to get practical men to set out and superintend the work, and, in the face of he present times, assist the tenant in doing that which he cannot do himself, and, y so doing, enable him to procure his rent at the time it becomes due; instead of whipping him up and threatening him with distress the moment he got into rrears, and thus meet him with a face all smiles and thankfulness, instead of one s long as a fiddle, and grievances to recount sufficient to fill a sheet of foolscap aper. There is no class of men upon earth so grateful as the British farmer. I lo not mean the gentleman farmer, but the man who gets his living for himself and amily from his farm, and whose *all* is invested in it; and there is no man whose eart is so light and happy as the farmer, who, with his half-year's rent in his ocket, can meet his landlord, or the agent of his landlord, with a smiling face, pay is rent, enjoy his dinner and a pipe afterwards, and then return home with the leasing reflection to his family that he met his landlord, and that he behaved kindly o him, and promised him various things which required doing upon his farm. It is this class of farmers, too, who want assisting, as, when the harvest is over, he has to begin to sell his spring corn to pay his servants' wages, his wheat, part to pay his Michaelmas rent, and before Lady-day his stock-yard is cleared. Great rises in the market he never can reap the benefit of, because he cannot keep a wheat-stack to look at; it is only the gentleman farmer who can derive any benefit from the sudden advance of the market. The system, too, of giving back 10 or 15 per cent., and in some instances 20 per cent., is bad in principle as well as in practice—*it gives the landlord a fictitious rental, and returns to the tenant a sum of money in bad times, which he cannot afford to lay out upon his land, but uses for other purposes.*" —(P. 4-5.)

Perhaps the most carefully-prepared portion of Mr Hutchinson's work is that which relates to deep draining; and on that branch of the subject, as well as on most other kinds of draining, hints and suggestions will be found, useful even to those who are familiarly conversant with the subject, and, *a fortiori*, to such as are not, like the author, *professors of the science.*

Promotion of Vegetation in Drought. By Mr PETER MACKENZIE, West Plean, Stirling.—However well ground may be prepared, by digging in a garden, or by ploughing in a field—although the manure may be such as will best suit the intended crop, and the seed be of the best quality, and also the natural enemies of the crop be kept in subjection, yet a failure will sometimes happen. A severe drought will prevent the manure from performing its intended part, and, in a great measure, lay an embargo upon the operations of vegetation; and thus, by means of dry weather, the hopes of the cultivator are often blasted.

Making known the results of a few experiments, in order to promote the growth of vegetables in dry weather, may, perhaps, not be uninteresting to the readers of this Journal. They may be useful to the farmer who cultivates a garden, and who may not have time to water his crops when they require it.

We are informed by chemists and vegetable physiologists, that water performs an important part in the growth of vegetables, such as conveying oxygen when seeds are springing, and other useful materials that are wanted by plants during their season of growth. We are informed in Lindley's Theory of Horticulture, "It is when plants are in a state of growth that an abundant supply of moisture is required in the earth; as soon as young leaves sprout forth, perspiration commences, and a powerful absorption must take place by the root. The younger the leaves are, the more rapid their perspiratory action." In dry weather we often observe the leaves of plants flag and die, the root not being able to supply the necessary moisture to the leaves. Watering in such a season is often resorted to, and is seldom done in a manner to benefit the crops. It often lowers the temperature of the soil and retards vegetation. Watering is also often a laborious employment, and sometimes a profitless one, when the water contains baneful ingredients to vegetation.

I have often observed in hot weather how well young crops grew in peat; even when the surface was dry and fit for burning, the moisture under was sufficient to supply the wants of the crops. I thought that peat would make a good covering for the roots of plants when a drought set in. I tried it first on young onions. Part of a bed was covered with it, and in a few days its good effect was visible. The whole of the onion crop was covered with it except a small bed which was left uncovered, on purpose to observe the difference between the two modes. It was the same sort of soil as the other beds, there being only a one-foot alley between them, and it was dug the same day as the rest, and dunged with the same sort of manure. There were eight varieties of onion-seed [so]wn, and the seed sown in that bed was a mixture of them all. Al-

the hot weather continued, they were never watered. They
v well, with the exception of the uncovered part; on it,
ons were numerous enough, but very small. The peat was
ied with pease. A sowing of dwarf marrowfat pease set
their growth, and had the appearance of being a failure; they
me time watered, but the water had little effect upon them.
were two rows of them; the roots of one of the rows were
l with peat, the other was left uncovered. The row which
e peat improved greatly, and produced a fair crop, while
er row was stunted in the straw, had a yellow appearance,
oduced small pods. It was also tried about the roots of
wer plants, which, I believed, improved them much. This
I have used it earlier for the onion crop than was done
ar. The hot weather in the end of April and beginning of
ried the surface of the ground greatly, but I have never
d to water the crop, and it looks well as far as it has
I reckon it a great advantage gained at this season of
r, which is generally a busy one, to save time and labour,
o to look upon a thriving crop. One good thing sometimes
another along with it: many a crop of onions in some soils
red in dry weather from want of weeding. The gardener
id to weed them in case of loosening the roots and injur-
e crop; but, with a peat covering, they may be cleaned at
e without affecting the plants, and the weeds are extracted
asier than when the soil is dry and parched. The peat is
t to the outside of the garden during winter, and put into
, ready to be used when required. It is cut small with
e, taken away in a wheelbarrow, and spread where it is
l, by means of a spade or shovel; but where very young
are intended to be covered, such as onions about an inch
r seed-beds of German greens, Brussels sprouts, cabbage,
, &c., I prefer sifting the peat through a wire sieve, with
n the sieve about half an inch square. I also put it in by
of the sieve. It can be put on more evenly, the cracks of
l better filled up, and none of the young plants covered.
uantity used is about a barrowful to seven square yards.
are somewhere about 4,900 square yards in an acre; that
vided by seven will give 700, and allowing two bushels to
rrow, it will require 1400 bushels; but if fine peat were used
tops of drills, much less would be required than if the sur-
ere flat;—and as there is about 60 per cent. of water in
at used, such a quantity must be of service to young
in hot weather. Some may be afraid of using so much
or their land—and in wet undrained fields it may be injuri-
t in well drained land and light soil it will be advantageous,
lly when it is so finely divided. And as to peat-water, ex-
ents have been tried with it and rain-water, and plants

watered with juice squeezed out of peat, have put forth more leaves, and of a deeper green, than with rain-water. Peat is put on as full of moisture as it can conveniently be used; this may be easily known, by taking a small quantity in the hand and pressing it tightly. If water drops from between the fingers, it will work well enough—if no water comes by pressure, a little may be added—but too much prevents it passing through the sieve freely. Some may be ready to ask why draining is carried to such an extent at the present day, when moisture is so essential to vegetation; there is, however, a great difference, so far as quality is concerned, between the fertilizing showers of heaven and the stagnant water of undrained land—the one brings life and vigour to vegetation, the other destruction and death. What is good for the garden is seldom bad for the farm; and in many soils the farmer suffers much from drought. Might not the same material be used with advantage for agricultural purposes? There may, perhaps, be some difficulty in applying it to some crops, but, if found to be useful, that difficulty, no doubt, would be overcome. Perseverance may enable the cultivator of the soil to attain, as it were, a victory over wet land and wet seasons—would it not be desirable that he should also be able in some degree to save his crop from injury when a severe drought is likely to ruin it? Turnips, for instance, are often destroyed by drought and the beetle. The dry soil in which turnip-seed is often sown has not moisture enough to nourish the plants, especially when hot weather, without rain, follows the sowing. The plants grow slowly, and in their slow growth an opportunity is afforded the beetle to devour them, whereas, if a thin layer of pulverized peat had been put along the top of the drill, much moisture might be retained, and given vigour to the plants to overcome their enemies; and in light soils the peat might be useful in other years for retaining water, and also providing the soil with vegetable matter—for peat will decompose, though slowly.

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Peas.	Beans.
1844. Feb.	Danzig.	36/ to 42/	17/ to 21/	10/6 to 12/6	20/ to 21/	21/6 to 23/6	22/ to [illegible]
Mar.	..	35/6 40/6	17/9 20/6	10/ 12/6	17/6 19/6	18/6 21/6	19/ [illegible]
April	..	36/ 41/	17/6 19/6	10/ 12/	16/6 18/6	20/ 23/6	19/ [illegible]
May	..	37/ 42/	16/ 18/	9/6 12/	16/ 18/	19/ 21/	18/6 [illegible]
Feb.	Hamburg.	35/ 41/	20/6 25/	10/6 11/	22/ 27/6	19/ 21/6	19/ [illegible]
Mar.	..	36/ 42/6	19/6 24/	11/ 14/	25/ 30/	18/6 22/	19/6 [illegible]
April	..	35/ 38/6	17/6 23/6	10/ 12/6	22/6 26/	17/6 21/6	18/ [illegible]
May	..	34/ 38/	16/6 20/6	10/6 12/6	21/ 25/	17/ 20/6	17/6 [illegible]
Feb.	Bremen.	36/ 42/	18/6 23/	10/ 11/6	20/ 22/	20/6 24/	20/ [illegible]
Mar.	..	35/6 40/	18/ 21/6	10/ 14/	18/6 21/	19/6 22/	20/ [illegible]
April	..	35/ 40/	16/6 19/	9/6 13/	17/ 20/	18/6 21/6	19/6 [illegible]
May	..	34/ 38/6	16/ 18/6	9/ 12/	16/6 18/9	17/6 20/6	19/ [illegible]
Feb.	Konigsburg.	36/6 40/6	24/ 29/	12/6 15/	19/6 21/6	18/6 21/6	18/ [illegible]
Mar.	..	36/ 40/	22/ 26/	11/6 13/6	18/6 21/	19/ 22/6	18/6 [illegible]
April	..	35/6 40/	17/6 22/	10/6 12/6	18/6 21/	18/ [illegible]	18/ [illegible]
May	..	35/ 41/	16/6 21/	10/ 12/	18/ 20/	17/6 22/	18/ [illegible]

Freights averaged from 3/ to 4/2 per quarter to Great Britain.

TABLE OF PRICES, &c.

Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

[Wh]eat.	Barley.		Oats.		Rye.		Pease.		Beans.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
0	34	4	19	11	32	6	30	6	28	7
5	34	6	20	2	33	2	30	8	28	6
3	34	6	20	7	32	4	29	8	29	7
7	34	10	20	2	32	0	28	4	28	9
11	34	7	20	8	34	2	28	6	28	4
3	34	9	20	9	34	6	29	2	28	11
5	34	5	20	2	33	8	28	10	29	2
1	34	6	20	3	34	4	28	6	28	7
7	33	10	19	10	33	9	28	2	28	6
11	34	3	21	4	32	8	28	5	28	8
2	34	5	20	0	32	2	29	3	29	2
3	33	8	20	3	34	0	28	8	28	9
11	32	10	20	4	33	3	28	6	28	10
2	30	11	20	5	32	6	28	2	28	2
4	31	8	20	8	32	2	29	6	30	9
4	31	6	21	2	31	4	31	4	32	1
7	27	8	21	7	31	6	32	2	31	3

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1844.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 7.	54	6	35	1	20	6	31	0	31	5
14.	55	4	34	10	20	1	30	8	31	3
21.	55	3	34	3	20	6	31	2	31	6
28.	55	0	34	9	21	6	31	6	32	6
Mar. 6.	55	5	34	1	21	4	33	0	33	10
13.	55	9	35	2	22	2	32	2	32	9
20.	55	8	35	8	22	8	32	6	33	0
27.	56	10	37	0	22	9	33	4	34	0
April 3.	58	3	36	5	23	2	34	0	34	8
10.	58	11	36	2	23	1	33	2	33	10
17.	59	1	34	4	22	11	33	6	34	2
24.	58	6	33	4	22	8	32	9	33	4
May 1.	59	1	33	3	22	6	33	0	33	9
8.	57	4	33	7	22	4	33	2	33	10
15.	57	6	34	1	22	9	33	6	34	2
22.	58	2	34	8	23	6	31	9	34	6
29.	58	7	35	0	24	2	34	0	34	9

LIVERPOOL.

[Wh]eat.	Barley.		Oats.		Rye.		Pease.		Beans.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
6	32	9	17	10	32	2	30	9	31	0
2	29	10	18	1	33	6	31	10	32	2
7	34	5	17	10	33	8	32	6	33	5
2	31	5	19	8	32	4	33	2	33	0
8	33	11	18	8	33	2	33	1	31	2
9	30	7	19	9	32	8	32	6	32	6
1	33	11	19	10	33	9	33	8	34	4
10	29	1	18	11	32	10	32	8	32	1
8	30	6	17	8	32	6	33	9	33	6
1	29	8	18	9	32	1	31	8	32	5
0	27	6	19	4	31	8	33	1	33	2
6	33	3	18	5	31	2	33	10	34	4
0	29	9	18	6	30	4	32	9	31	0
2	31	4	18	4	30	6	32	2	32	1
6	29	4	19	9	31	4	33	3	33	4
0	31	6	20	1	31	10	34	0	34	1
5	29	6	19	7	32	3	34	6	34	5

DUBLIN.

Date.	Wheat per Barrel 20 St.		Barley per Barrel 16 St.		Bear per Barrel 17 St.		Oats per Barrel 14 St.		Flour, per Barrel 9 St.	
1844.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 2.	30	10	16	8	13	1	10	2	18	2
9.	31	4	15	9	13	6	10	5	18	5
16.	32	0	16	2	14	2	10	8	19	0
23.	32	6	17	9	15	4	10	3	19	6½
Mar. 1.	32	3	17	8	15	1	10	8	19	6
8.	32	4	15	11	14	2	10	7	19	4
15.	32	6	15	5	14	6	10	8	19	5
22.	32	5	15	6	14	3	10	8	19	3
29.	30	6	16	0	14	8	10	1	19	4
April 5.	32	3	15	6	14	4	10	6	19	0
12.	32	2	15	8	14	1	10	4	18	4
19.	32	4	16	10	14	3	10	7	18	9
26.	32	0	15	8	14	0	10	2	18	10
May 3.	31	10	15	7	14	1	10	3	18	0
10.	32	0	16	0	14	6	10	4	18	6
17.	32	8	16	4	14	4	11	7	19	0
24.	32	2	16	6	14	5	11	8	18	6

[S]hewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. [...] 58, and 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties payable [on FOR]EIGN CORN: the Duties payable thereon, from Feb. 1844, to June 1844.

Wheat.					Barley.						Oats.						Rye.						Pease.						Beans.					
	Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
4	51	2	19	0	33	2	33	0	5	0	18	11	18	8	8	0	31	10	32	2	10	6	30	8	30	10	10	6	29	8	29	8	11	6
5	51	7	19	0	33	1	31	2	5	0	19	1	18	10	8	0	32	9	32	5	10	6	30	6	30	8	10	6	30	10	29	7	11	6
7	52	2	18	0	33	4	33	4	5	0	19	6	19	0	7	0	32	5	32	11	10	6	31	3	30	9	10	6	30	6	29	10	11	6
1	52	11	18	0	33	7	33	5	5	0	19	7	19	2	7	0	32	10	32	9	10	6	21	2	30	9	10	6	30	4	29	11	11	6
2	53	8	18	0	33	9	33	6	5	0	20	0	19	4	7	0	35	3	33	5	9	6	31	8	30	11	10	6	30	5	30	1	10	6
5	54	4	18	0	33	6	33	5	5	0	19	11	19	6	7	0	33	9	33	7	9	6	32	6	31	0	10	6	31	0	30	4	10	6
3	54	11	18	0	33	3	33	5	5	0	20	1	19	8	7	0	34	8	33	7	9	6	31	4	31	1	10	6	31	3	30	7	10	6
5	55	7	17	0	33	1	33	5	5	0	20	0	19	10	7	0	34	1	33	10	9	6	31	0	31	2	10	6	31	2	30	10	10	6
5	56	1	16	0	32	7	33	3	5	0	19	8	19	11	7	0	33	3	33	10	9	6	31	0	31	4	10	6	31	2	30	11	10	6
5	56	2	16	0	32	10	33	2	5	0	20	1	20	0	6	0	33	1	33	11	9	6	31	8	31	3	10	6	30	11	31	0	10	6
1	55	11	17	0	31	1	33	1	5	6	20	2	20	1	6	0	32	4	33	6	9	6	32	5	31	6	10	6	31	2	31	1	10	6
4	55	10	17	0	32	10	32	11	6	0	20	7	20	0	6	0	32	9	33	3	9	6	31	5	31	6	10	6	31	3	31	2	10	6
6	55	8	17	0	32	7	32	10	6	0	20	1	20	2	6	0	31	2	32	10	10	6	30	8	31	4	10	6	31	4	31	2	10	6
9	55	6	17	0	31	8	32	7	6	9	21	2	20	1	6	0	30	11	[illegible]	3	10	6	31	2	31	5	10	6	31	9	31	3	10	
1	55	3	17	0	31	5	32	5	6	0	20	5	20	2	6	0	31	4	32	0	10	6	32	3	31	7	10	6	32	5	31	6	[illegible]	
0	55	4	17	0	31	1	32	[illegible]	6	0	21	0	20	4	6	0	31	2	31	7	10	6	31	8	31	7	10	6	33	3	31	11		
9	55	6	17	0	30	7	31	8	7	0	21	2	20	6	6	0	31	7	31	5	10	6	31	7	31	5	10	6	33	11	32	4		

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; upon which duties have been paid for home-consumption, during the same Month; a tities remaining in Warehouse at the close thereof, from 5th February, 1844, to 5th M

Month ending	IMPORTED. From Foreign Countries.	IMPORTED. From British Possessions.	IMPORTED. Total.	CHARGED WITH DUTY. From Foreign Countries.	CHARGED WITH DUTY. From British Possessions.	CHARGED WITH DUTY. Total.	REMAINING IN From Foreign Countries.	REMAINING IN From British Possessions
Feb. 5, 1844.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu	Qrs. Bu	Qrs. Bu.	Qrs. Bu	Qrs.
Wheat, .	34,066 2	1,354 3	35,420 5	918 7	2,627 5	3,546 4	219,116 0	73[illegible]
Barley, .	16,305 1	12 7	16,318 0	8,019 6	12 7	8,[illegible]62 5	18,935 6	.
Oats, . .	122 1	149 7	273 0	152 1	59 3	211 4	57,471 4	90
Rye, . . .	. .	. .	. .	. .	. .	. .	2,221 2	. .
Pease, .	3,326 6	873 7	4,200 5	958 7	873 7	1,832 6	27,856 6	386
Beans, .	2,985 6	. .	2,985 6	14,213 6	. .	14,213 6	74,476 0	. .
Totals,	56,806 0	2,391 0	59,193 0	24,293 3	3,573 6	27,867 1	400,077 2	1,211
Mar. 5, 1844.								
Wheat, .	16,074 2	. .	16,074 2	1,673 2	308 0	1,981 2	229,739 0	116
Barley, .	13,361 4	. .	13,361 4	13,218 3	. .	13,218 3	21,040 6	. .
Oats, . .	1,218 3	. .	1,218 3	386 1	. .	386 1	57,380 6	90
Rye, . .	3 0	. .	3 0	3 0	. .	3 0	2,221 2	.
Pease, . .	1,634 6	107 6	1,742 4	1,563 3	107 6	1,671 1	26,453 0	. .
Beans, . .	918 1	. .	918 1	1,218 6	. .	1,218 6	73,996 3	.
Totals,	33,210 0	107 6	33,317 6	18,062 7	415 6	18,478 5	410,811 1	207
Apr. 5, 1844.								
Wheat, .	39,601 4	. .	39,601 4	3,075 5	. .	3,075 5	258,736 2	116
Barley, .	9,452 4	. .	9,452 4	13,763 3	. .	13,763 3	16,764 3	. .
Oats, . .	2,065 3	. .	2,065 3	937 4	. .	937 4	56,753 0	90
Rye, . .	. .	. .	. .	341 0	. .	341 0	1,880 2	. .
Pease, .	1,283 3	. .	1,283 3	2,503 2	. .	2,503 2	25,345 0	. .
Beans, .	525 0	. .	525 0	8,538 4	. .	8,538 4	66,465 6	. .
Totals,	52,957 6	. .	52,957 6	29,159 2	. .	29,159 2	425,944 5	207
May 5, 1844.								
Wheat, .	67,997 1	63 7	68,061 0	80,816 5	63 7	80,880 4	238,167 4	116
Barley, .	97,737 5	4 1	97,741 6	109,261 5	4 1	109,265 6	4,835 7	. .
Oats, . .	5,215 4	. .	5,215 4	6,015 3	. .	6,015 3	54,812 7	90
Rye, . .	726 0	. .	726 0	1,254 0	. .	1,254 0	1,352 2	. .
Pease, .	3,109 3	231 5	3,341 0	3,611 7	231 5	3,843 4	21,820 2	. .
Beans, .	2,909 6	. . .	2,909 5	6,380 0	. .	6,380 0	62,264 2	. .
Totals,	177,695 2	299 5	177,994 7	207,339 4	299 5	207,639 1	385,933 0	207
Feb. 5, 1844	cwt. qr. lb	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb	cwt. qr. lb.	cwt. qr. lb	cwt. qr. lb.	cwt. q
Flour, .	1,695 3 0	17,201 2 20	18,897 1 20	42 0 21	1,8537 1 16	18,579 2 9	87,277 3 18	3,859 [illegible]
Oatmeal,	. .	524 2 21	524 2 24	. .	24 3 1	24 3 1	7 3 18	777 [illegible]
Totals,	1,695 3 0	17,726 1 16	19,422 0 16	42 0 21	18,562 0 17	18,604 1 10	87,285 3 8	4,636 [illegible]
Mar. 5, 1844.								
Flour, . .	26,259 2 22	4,892 1 26	31,152 0 20	171 2 16	2,433 3 21	2,605 2 9	111,577 3 16	6,317 [illegible]
Oatmeal,	. .	1 2 11	1 2 11	. .	253 2 26	253 2 26	7 3 18	525 [illegible]
Totals,	26,259 2 22	4,894 0 9	31,153 3 3	171 2 16	2,687 2 19	2,859 1 7	111,585 3 6	6,813 [illegible]
Apr. 5, 1844								
Flour, . .	12,879 3 15	1,714 3 16	14,594 3 3	566 0 23	349 3 9	916 0 4	121,317 0 4	8,067 [illegible]
Oatmeal,	. .	. .	. .	. .	275 1 6	275 1 6	7 3 18	219 [illegible]
Totals,	12,879 3 15	1,714 3 16	14,594 3 3	566 0 23	625 0 15	1,191 1 10	121,324 3 22	8,297 [illegible]
May 5, 1844.								
Flour, . .	42,534 1 19	996 0 7	43,530 1 26	4,733 1 15	4,319 0 15	9,082 2 2	153,624 1 22	4,694 [illegible]
Oatmeal,	. .	. .	. .	. .	198 1 13	198 1 13	7 3 18	51 [illegible]
Totals,	42,534 1 19	996 0 7	43,530 1 26	4,733 1 15	4,547 2 0	9,280 3 15	153,632 1 12	4,746 [illegible]

PRICES of BUTCHER-MEAT.

Date.	LONDON, Per Stone of 14 lb. Beef.	LONDON, Mutton.	LIVERPOOL, Per Stone of 14 lb. Beef.	LIVERPOOL, Mutton.	MORPETH, Per Stone of 14 lb. Beef.	MORPETH, Mutton.	EDINBURGH, Per Stone of 14 lb. Beef.	EDINBURGH, Mutton.	Gl[illegible] Per [illegible] Beef.
1844.									
Feb.	5/0 to 7/0	5/6 to 7/6	5/0 to 7/0	5/3 to 7/3	4/9 to 6/9	5/0 to 7/0	5/0 to 6/9	5/3 to 7/0	5/3 t[illegible]
March	5/0 6/9	5/3 7/3	5/0 6/9	5/3 7/0	4/9 6/6	5/0 6/9	5/0 6/6	5/0 6/9	5/6 [illegible]
April	5/0 7/0	5/3 7/6	5/0 7/0	5/6 7/6	5/0 6/9	5/0 6/9	5/0 6/9	5/0 6/9	5/0
May	5/0 6/9	5/3 7/0	5/3 7/0	6/0 7/9	5/3 7/0	5/3 7/0	5/6 7/3	5/3 7/0	5/6

[illegible]RIC[illegible] [illegible] English and Scotch WOOL.

[illegible]	[illegible]	[illegible]	Scotch, per 14 lb.		
[illegible]	[illegible]	[illegible] 22	Leicester Hogg,	. .	16/6 to
[illegible]	4/	16/[illegible]	Ewe and Hogg,	. .	13/6
[illegible]	6/	19/[illegible]	Cheviot, white,	. .	13/
Half Bred	4/	16/[illegible]	Laid, washed,	. .	[illegible]
[illegible]ster Hogg	6/	20/	unwashed,	. .	[illegible]
Ewe and Hogg	4/	16/6	Moor, white,	. .	[illegible]
[illegible]	7/	10/6	Laid, washed,	. .	[illegible]
[illegible]	3/6	8/	unwashed,	. .	[illegible]

THE REVENUE.

BSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th January, 1844, and 5th of April, 1844— shewing the Increase and Decrease on each head thereof.

	Quarters ending April 5. 1843.	Quarters ending April 5. 1844.	Increase.	Decrease.	Years ending April 5. 1843.	Years ending April 5. 1844.	Increase.	Decrease.
	L.	L.	L.	L.	L.	L.	L.	L.
ms, ...	4,219,537	4,604,447	384,910	. .	18,799,794	19,458,129	658,335	. .
e, ...	1,767,373	1,852,689	85,316	. .	11,405,516	11,880,123	474,607	. .
s, ...	1,593,126	1,639,011	45,885	. .	6,484,739	6,472,040	. .	12,699
, ...	142,698	144,685	1,987	. .	4,265,537	4,192,173	. .	73,064
Office, . .	144,000	174,000	30,000	. .	607,000	622,000	15,000	. .
llaneous, .	576,556	691,202	114,646	. .	915,274	1,281,977	366,703	. .
rty Tax, .	1,885,232	1,992,859	107,627	. .	2,456,288	5,356,887	2,900,599	. .
	10,328.522	11,098,893	770,371		44,934,148	49,263,329	4,415,244	85,763
	Deduct Decrease.		. .		Deduct Decrease.		85,763	
	Increase on the Qr.		770,371		Increase on the Year.		4,329,481	

RS PRICES *of the different COUNTIES of SCOTLAND, for Crop and Year 1843, by the Imperial Measure.*

RDEENSHIRE.

	Imp. qr.
hout fodder, .	48/
h fodder, . . .	57/
hout fodder, . .	29/
fodder, . . .	35/
ut fodder, . .	26/9
odder, ...	32/6
to, without fod.,	18/6
— with fodder,	25/8
te, without fod.,	16/10
—— with fodder,	24/
. . . .	25/10
. . . .	25/10
included, . . .	48/
40 lb.	13/

ARGYLE.

. . . .	42/10
. . . .	25/
. . . .	24
. . . .	16/4
. . . .	27
er 140 lbs. . . .	12/10

AYR.

. . . .	46/8$\frac{3}{4}$
. . . .	26/5$\frac{3}{4}$
. . . .	24/10$\frac{1}{4}$
te, ...	14/2$\frac{1}{2}$
Beans, ...	29/9
er 140 lb. . . .	12/1$\frac{1}{2}$

BANFF.

. . . .	50/7
thout fodder, . .	27/3
th fodder, . . .	31/3
t, without fodder,	24/4
— with fodder, .	28/4
nd, without fod.,	23/
—— with fodder,	27/
to, without fod.,	19/2
—— with fodder,	24/2
mon, without fod.,	17/3
—— with fodder,	22/3
. . . .	27/
. . . .	28/
per 140 lb . . .	12/

BERWICK.

	Imp. qr.
Wheat, ...	50/7$\frac{1}{12}$
Barley, Merse, ...	27/7$\frac{9}{12}$
—— Lammermuir, . .	26/10$\frac{4}{12}$
Oats, Merse, ...	19/7$\frac{8}{12}$
—— Lammermuir, . .	18/4$\frac{5}{12}$
Pease, ...	31/1
Oatmeal, per 140 lb . . .	14/1$\frac{2}{12}$

BUTE.

Wheat, ...	
Barley, ...	
Bear, ...	
Oats, ...	
Pease, ...	
Beans, ...	
Oatmeal, per 140 lb . . .	

CAITHNESS.

Bear, ...	23/7$\frac{1}{2}$
Oats, Hopeton, ...	14/10$\frac{1}{2}$
—— Sandy, ...	15/7$\frac{1}{2}$
—— Dun, ...	15/10
—— Black, ...	12/5$\frac{3}{4}$
Oatmeal, per 140 lb . . .	12/2$\frac{1}{4}$

CLACKMANNAN.

Wheat, ...	45/5
Barley, Kerse, ...	29/8$\frac{3}{4}$
—— Dryfield, ...	28/3$\frac{1}{2}$
Oats, Kerse, ...	18/6$\frac{3}{4}$
—— Dryfield, ...	17/11$\frac{1}{4}$
Pease and Beans, ...	27/11$\frac{1}{4}$
Malt, ...	50/0$\frac{1}{2}$
Oatmeal, per 140 lb . . .	14/1$\frac{1}{2}$

DUMBARTON.

Wheat, ...	48/1
Barley, ...	28/1
Bear, ...	25/9
Oats, ...	17/1
Pease and Beans, . . .	31/4
Oatmeal, per 140 lb . . .	13/9

DUMFRIES.

	Imp. qr.
Wheat, ...	48/10
Barley, ...	26/8
Bear, ...	23/4
Oats, Potato, ...	16/10
—— Common, ...	15/6
Pease, ...	30/
Beans, ...	32/4
Malt, ...	63/
Oatmeal, per 140 lb . .	12/3$\frac{1}{2}$

EDINBURGH.

Wheat, First, ...	51/6
—— Second, ...	49/5$\frac{3}{4}$
Barley, First, ...	33/
—— Second, ...	31/9$\frac{3}{4}$
—— Third, ...	31/2$\frac{3}{4}$
Oats, First, ...	21/0$\frac{1}{2}$
—— Second, ...	18/10$\frac{3}{4}$
Pease and Beans, ...	30/1$\frac{1}{2}$
Oatmeal, per 112 lb . . .	11/2$\frac{1}{2}$

ELGIN & MORAY.

Wheat, ...	50/3
Barley, ...	29/3
Oats, ...	17/8
Rye, ...	33/
Pease and Beans, ...	32/7$\frac{1}{2}$
Oatmeal, per 112 lb . . .	11/7

FIFE.

Wheat, White, ...	48/7$\frac{3}{4}$
—— Red, ...	46/7$\frac{3}{4}$
Barley, ...	27/1$\frac{3}{4}$
Bear, ...	25/4$\frac{3}{4}$
Oats, ...	18/8$\frac{1}{2}$
Pease and Beans, ...	26/8$\frac{1}{2}$
Rye, ...	29/3
Malt, ...	53/1$\frac{3}{4}$
Oatmeal, per 280 lb . . .	28/

FORFAR.

Wheat, ...	50/
Barley, ...	28/6
Bear, ...	27/8

FORFAR *(Continued.)*

	Imp. qr.
Oats, Potato,	18/9
—— Common,	18/8
Pease and Beans,	26/5
Rye,	26/7
Oatmeal, per 140 lb.	13/6

HADDINGTON.

Wheat, First,	54/5½
——— Second,	51/3¼
——— Third,	48/8¼
Barley, First,	33/11
——— Second,	31/10½
——— Third,	29/10¼
Oats, First,	22/1½
—— Second,	21/0½
—— Third,	19/11¾
Pease and Beans, First,	
——— Second,	
——— Third,	

INVERNESS.

Wheat, without fodder,	48/9
with fodder,	55/3
Barley, without fodder,	27/6
with fodder,	32/6
Bear,	
Oats, potato, without fodder,	19/
—— with fodder,	25/6
—— Hopeton, without fod.,	18/
—— with fodder,	24/6
—— Common,	18/
——— with fodder,	24/6
Oatmeal, per 112 lb	13/2

KINCARDINE.

Wheat, without fodder,	49/6½
—— with fodder,	59/6½
Barley, without fodder,	27/6
—— with fodder,	35/6
Bear, without fodder,	25/8¼
—— with fodder,	33/8¼
Oats, Potato, without fod.	18/11
th fodder,	27/11
White, ithout fod.,	17/4¾
——— with fodder,	26/4¾
Pease, without fodder,	26/
—— with fodder,	36/
Beans, without fodder,	26/7½
—— with fodder,	37/7½
Oatmeal, per 140 lb	13/5½

KINROSS.

Wheat,	43/
Barley, First,	27/6
—— Second,	25/
Bear, First,	
—— Second,	
Oats, White, First,	17/4
Second,	15/4
Black First,	
Second,	
Pease, and Beans,	28/3
Oatmeal per 280 lb	27/4

KIRKCUDBRIGHT.

Wheat,	48/8
Barley,	26/6
Bear,	
Oats, Potato, and Hop,	16/8
—— Common,	15/
Oatmeal, per 140 lb	12/1

LANARK.

	Imp. qr.
Wheat, First,	46/0 $\frac{8}{12}$
——— Second,	44/5 $\frac{8}{12}$
——— Third,	40/
Barley, First,	30/8 $\frac{11}{12}$
——— Second,	28/6 $\frac{8}{12}$
Bear, First,	26/7 $\frac{4}{12}$
—— Second,	
Oats, First,	17/4 $\frac{11}{12}$
—— Second,	15/8 $\frac{6}{12}$
Pease,	29/11
Beans,	29/11 $\frac{4}{12}$
Malt,	54/
Oatmeal, per 140 lb	13/0 $\frac{4}{12}$

ARCHBISHOPRIC OF GLASGOW.

Barley,	
Oats,	
Malt,	
Oatmeal, per 140 lb	

LINLITHGOW.

Wheat,	48/1
Barley,	32/1
Oats,	18/4
Pease,	29/4
Malt,	53/9
Oatmeal, per 140 lbs.	13/4

NAIRN.

Wheat,	51/
Barley, without fodder,	28/
—— with fodder,	33/
Oats, without fodder,	18/
—— with fodder,	26/
Oatmeal, per 112 lb	11/6

ORKNEY.

Bear, per 365 lb,	14/2
Malt, 140 lb without duty,	15/11
—— with duty,	2?/4
Otameal, per 140 lb	10/

PEEBLES.

Wheat, First,	52/5¾
——— Second,	48/0¼
——— Third,	42/10
Barley, First,	30/6¾
——— Second,	28/11½
——— Third,	27/2½
Oats, First,	17/7½
—— Second,	16/5½
—— Third,	15/0¾
Pease, First,	32/11
—— Second,	32/0¾
—— Third,	31/0¾
Oatmeal, First, per 140 lb	13/6½
——— Second,	13/0½
——— Third,	12/9¼

PERTHSHIRE.

Wheat, First,	48/5
—— Second,	43/5
Barley, First,	27/1
—— Second,	25/1
Oats, First,	18/8
—— Second,	16/
Pease and Beans,	27/9
Oatmeal, per 140 lb	13/5

RENFREW.

	Imp. qr.
Wheat, First,	[illegible]
——— Second,	[illegible]
Barley, First,	[illegible]
——— Second,	[illegible]
Bear, First,	[illegible]
—— Second,	[illegible]
Oats, First,	[illegible]
—— Second,	[illegible]
Beans, First,	[illegible]
——— Second,	[illegible]
Oatmeal, per 140 lb	[illegible]

ROSS AND CROMARTY.

Wheat, First,	[illegible]
——— Second	[illegible]
Barley,	[illegible]
Bear,	[illegible]
Oats, First,	[illegible]
—— Second,	[illegible]
Pease and Beans,	[illegible]
Oatmeal, per 140 lb	[illegible]

ROXBURGH.

Wheat,	[illegible]
Barley,	[illegible]
Oats,	[illegible]
Pease,	[illegible]
Beans,	[illegible]
Oatmeal, per 140 lb	[illegible]

SELKIRK.

Wheat,	[illegible]
Barley,	[illegible]
Oats, Potato,	[illegible]
—— Common,	[illegible]
Pease and Beans,	[illegible]
Oatmeal, per 280 lb	[illegible]

STIRLING.

Wheat,	[illegible]
Barley, Kerse,	[illegible]
——— Dryfield,	[illegible]
Oats, Kerse,	[illegible]
—— Dryfield,	[illegible]
—— Muirland,	[illegible]
Pease and Beans,	[illegible]
Malt,	[illegible]
Oatmeal, per 140 lb	[illegible]

SUTHERLAND.

Wheat,	
Barley,	[illegible]
Bear,	
Oats, Potato,	[illegible]
—— Common,	[illegible]
Pease,	
Oatmeal, per 140 lb	[illegible]

WIGTON.

Wheat,	[illegible]
Barley,	[illegible]
Bear,	[illegible]
Oats, Potato,	[illegible]
—— Common,	[illegible]
Malt,	[illegible]
Rye,	[illegible]
Pease and Beans,	[illegible]
Oatmeal, per 280 lb	[illegible]

We may inform our English readers, that Fiar Prices are the average prices of grain, as ascertained year by the verdict of Juries in every county of Scotland. These Juries are summoned in spring, and asc from the evidence produced to them, the average prices of the preceding crop. By these prices, rents p in grain, and similar contracts, are generally determined; but the main object is to convert into mon stipends (for the most part fixed at a certain quantity of grain) of the Scottish Clergy.

ICULTURE OF THE COUNTY OF MAYO IN IRELAND.

rt of Ireland is, in every respect, the least advanced, ›mparatively with the other counties of the kingdom in only with those of the same province.

ysis of the causes which may have operated against its ınt more properly belongs to the historian or statist, ›refore foreign from our department; yet, so far as es have obvious connexion with the agricultural condi- county, we may fairly notice them without any trans- ' our legitimate limits.

s to remote causes.

stern boundary of the island being so far removed astern side, where the English invaders had such faci- nding, and holding out no temptation in the superio- or climate, escaped the subjugation which De Courcy lowers imposed elsewhere. Morasses, forests, moun- loughs, were not then worth much contention, and, leath of Roderick O'Connor, the last of the indepen- s of Ireland, in 1198, until the time when De Burgo, of Ulster, (to one of whose ancestors King John had ınt of the county,) was assassinated, there is no histo- d of any interest. It was not until the reign of Eliza- that part of Ireland, which had previously been sepa- the *two counties* of *Connaught* and Roscommon, was ed and subdivided into counties; and it was then that y of Mayo (which took its name from a monastery ıe name on Lough Carra) was defined to its present

Sir Henry Sydney, the Queen's deputy, visited Con- ıe celebrated Grana Uile, or Grace O'Malley, from respectable family of that name have descended, held astle of Carrick-a-Uile, near Newport, against the ith success and singular bravery, though her father, other chieftains, had submitted to the Queen's autho- en, however, the resistance to her domination was the landowners agreed to pay, as composition for their s, ten shillings per quarter (of 120 acres) of yearly les furnishing some military contributions. At that return of chargeable acres made by a jury was only less than a fifth part of what the county actually con- ıout estimating waste,) which, it must be admitted, was l measure to the possessors—yet the representatives of had hardly reached Dublin, after concluding the com- hen the De Burgos (who had been previously granted

government protections) excited a resistance to the Queen, calculating on success, with the aid of 2,000 Scotch soldiers, who had landed near Sligo, in their cause. The consequences were disastrous to the insurgent natives, who were heavily mulcted in cattle, and some hostages who had been given by their leaders forfeited their lives.

Mayo had its share of confiscations at the termination of the war of 1641; but from that time until the last Irish rebellion, in 1798, it escaped all military and political agitations. The landing of a small French force at that period, under General Humbert, at Kilcummin Head, near Killala, which, after much gallantry and success on their side, was overpowered, is a matter well known in modern history.

At that time the greater part of the county to the west of the lakes was nearly destitute of roads; no way existed of travelling through Erris but on foot; or, if a horseman attempted the journey, he required the aid of six or eight guides on foot to cast the horse at every swamp, fasten his legs, and haul him over by ropes. The journey from Ballina to the coast could not be accomplished in less than three days, and if the rivers were swollen required a much longer time. The expense for guides, in money and refreshments, was more than that now required for a carriage and post-horses from Castlebar to the Mullet, a distance of fifty-six miles, which may be performed in a day. A carriage-road has been made along the banks of the Owenmore; one branch proceeds from Castlebar, another from Crossmolina; the former is level and well laid out, the latter labours under the effects of the old country system. After passing the mountains, a new line branches off to Bellmullet, and thence along the western side of Blacksod harbour. Other lines of road are in progress from the same point to the western side of Broadhaven; others to Cooran and Achill. By the former a communication will be opened to the north coast and Killala; the latter unites with a new line, also in progress, from Newport to the extremity of Achill. A new and level line of road has also been made from Killala to Ballina, Foxford, and Swinford, by which the produce of the interior of the country may be conveyed to the seaports. A new and very excellent line has been made from the head of the Killeries to Westport, being a continuation of the level line from Clifden through the wilds of Connemara and Joyce's country, thus opening a direct communication between Castlebar, Westport, and these districts of Galway. A new and excellent mail line has been opened between Castlebar and Ballina, crossing the narrow channel between Lough Conn and Lough Cullen by Pontoon Bridge; another line has been opened from Killala round the northern coast.*

The government have done their part in opening the grand lines of communication, and also in constructing piers and quays in many places; but what have the proprietors of the soil done towards the general welfare of the peasants who occupy it? What improvements have they of themselves effected? What [illegible] have they made, that were not from some purely selfish [illegible] jobbing motives? What models of good husbandry have [illegible] established? [illegible] ample farms have they established! [illegible] or their respective estates? [illegible] modern times (combined with the

* [illegible] ...ical Dictionary.

original very serious obstacles of soil, climate, and inaccessibility) retarded any material improvements, are the paucity of resident *independent* landlords, and the apathy of many proprietors, into whose heads it does not appear to enter that the means of increasing the productive powers of the soil, and of elevating the condition of a most miserable tenantry, are, to a considerable extent, in their own hands. The landlords may be needy and unable to undertake those costly improvements which most of the British landlords of the same station in life would consider imperative as a matter of self-interest and moral obligation. The celebrated reproof, "property has its duties as well as its rights," is at least as applicable in Mayo as in the locality to which it was so pointedly applied. Many of the landlords would, if they consulted common sense, industriously set to work as mere farmers on their properties, leaving hounds, and horses, and equipages, and every kind of expensive indulgence, to those who can really afford them, and thus set examples of frugality, and patient industry, and remunerative improvements, to their tenantry, instead of oppressing them with rack-rents to support a vain show and *pretensions* to which the actual amount of their incomes is ridiculously inadequate, and thus alienating the respect and affections of a class of people who, with fair and considerate treatment, would be devotedly attached to them.

Mayo was a grazing county until the war prices induced a general system of exhausting tillage wherever a blade of corn could be made to grow, and the proprietors let their farms to those who commenced their operations by burning the surface for potatoes, and afterwards forced oats as long as the land could bear them, for which they were very well paid for some years. The professional graziers pursued the same profitable course, seeing that more money was to be made in that way than by rearing cattle, and then there arose that infernal con-acre system, under which all Connaught has been so grievously scourged, which was promoted, not only by the middlemen, but by the owners of the soil, by which some of them realized, in a few years, sums equivalent to the value of the fee-simple.

Their practice has been to let their grass-lands to the needy peasantry around for two years in succession, at the rates of £10 and £8 per acre, with a power of burning the surface in the first instance. The con-acre portions being charged by the admeasurement and returns of a land-surveyor to each individual, the owner, if he is hard-pressed for cash, or doubtful of the solvency of his debtors, and, unwilling to take out the amount from their respective rents, without the slightest intimation, disposes of his claims against them for ready money to some petty parish usurer, who deducts twenty or thirty per cent. for his advance, and

most rigorously exacts "the pound of flesh" from the victims consigned to his tender mercies.

It is not long since a poet of the country described, in homely verse, for publication in the *Irish Farmer's Gazette*, the condition of those whom necessity renders victims to this grinding system. We must intreat permission to present four out of twenty stanzas by way of sample. Though the description is critically just from beginning to end as regards the cottier, we dare not offend against the *gravity* of our general character, as agricultural journalists, by transferring all of them to our pages.

Tune—THE HIGHLANDER.

Och Paddy! you gander,
You're like a Highlander
For want of the breeches, for want of the breeches.
I'll tell you the rason,
And that in good sason,
'Tis not timing the stitches, not timing the stitches.

Ah, there you go now,
Just like a starv'd sow,
A-gruntin' and groanin,' a-gruntin' and groanin';
The childher a-squakin',
The Farathee* quakin',
The ould wife a-moanin', the ould wife a-moanin'.

I see by the loy,†
That, like a child's toy,
Lies over your shoulder, lies over your shoulder,
With the end of it bint
To make con-acre rint,
You'll grow thin ere your oulder, you'll grow thin ere your oulder;

For while you're a taker
O' confounded con-acre,
You'll never get fat, you'll never get fat;
Your health will be spint
To pay ten pound of rint—
You'll be always poor, Pat, you'll be always poor, Pat.

The bard, however, does not take leave of his theme without contrasting the comfort and independence which poor Pat might attain by furrow-draining, as exhibited

"About fair Ballindine,
On the houldin' of Kelly, the houldin' of Kelly,"

who is, it appears, an improving small holder on the property of Lord Oranmore, in the barony of Clanmorris.

The peasantry of Mayo—many of whom, with the still greater proportions from the other counties of the same province, are led from necessity to make annual incursions into England, in order to obtain the means of satisfying the greedy cormorants who await

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* Farathee, the grandfather. † Loy, a Connaught spade.

their harvest gleanings—often affect to be poorer than they really are. They consider £6 as a small amount realized after the season's labour, and often bring back £8, or even more. Nor are those seekers after this periodical employment in Great Britain confined to the class of cottiers or mere labourers; among them are to be found the occupiers of a mountain farm, of it may be 100 or even 200 acres—half-a-score of which are perhaps productive—rented at £10 or £12 a-year.

Such little farmers are sometimes the *leaders* of gangs of eight or ten men, who place confidence in their shrewdness at striking bargains with the farmers who hire them to mow or reap, &c., by the piece, and their fidelity in dividing fairly the money which may be earned in that way.

An acquaintance of ours, whose residence was, until lately, in Shropshire, but who, from local connexions, frequently visits the counties of Galway and Mayo, had once or twice shot over the mountain farm of a man who afterwards appeared at his hall door in England with a gang of miserable looking labourers in search of harvest work. For three successive years the gentleman employed that party on his English farm in harvest work, and found them honest and correct in the fulfilment of their contracts, and scrupulously observant of their promise not to smoke in the barn in which they slept. These men—who provided their own food—worked very hard at their *jobs*, but, in *competition* with the English workmen, their sustaining powers failed, until they began to eat bacon, when their strength increased to the same degree with that of the others who had been habituated to animal food. On the last occasion of their leaving Shropshire and their employer—a fellow-countryman by birth—the leader, Pat Judge, expressed his hope of seeing "his honor" soon again on the hills of Mayo. The gentlemen jocosely asked him, "What will you give me for dinner, Pat, if I go to you?" "Bedad," said the other, with a most hospitable looking face, "I'll give you a turkey and a pig's head." And well able was he to afford such an entertainment, with at least two-thirds of his year's rent already earned by his labour during that season in England; and he then enjoyed the assurance, too, that his wife and friends, during his absence, had performed all the necessary labours of harvesting his crop, on the arable portion of his farm, as well as if he had been to the fore himself. But for one so circumstanced there are, probably, twenty in a very different condition at home, crushed by con-acre rack-rents, and in debt for seed-potatoes, seed-corn, and turf, so that, even if they have had a successful season in England, the claims upon them when they return to their cabins exhaust the amount of their earnings; and it happens, occasionally, that they are altogether disappointed in their

calculations of employment, and reduced to extreme distress in their efforts to return home.

As an illustration of our remark that these wandering labourers assume an air of greater poverty than the reality warrants, we may relate an anecdote which we believe to be true:—One of these, on his presenting himself, in rags, to the captain of a steamboat about to return from Liverpool to Dublin, and protesting, solemnly, that he had no money, after "a bad sason," but one shilling, was taken on board as a free passenger. In the course of the run, the captain, in pity to his tattered condition, gave him a pair of trousers. Ardent were the expressions of gratitude, and profuse the prayers bestowed upon the donor and his posterity, *in sæcula sæculorum*, during the time that the poor devil was encasing himself in the garment which he so much needed. The captain, thinking that the cast-off rags were not a very desirable kind of cargo on his deck, beckoned to a sailor to heave them overboard—an order which was executed in a twinkling—and then the benedictory exclamations were changed to those of impatient agony. "Och! murther, murther! my seven gould guineas," screamed forth the man who had so unfortunately let go his trousers in which were stitched up his yellow harvest, with such a genuine tone of grief, that a subscription of £3 was made for him among the passengers. The poor wretch, whose duplicity was justly punished, probably lost the sum which he declared to have been in his old breeches, for, during the surprize and horror of the moment, when they were being committed to the deep, he had no time for inventing what he stated.

From the paucity of wealthy and liberal resident land proprietors in Mayo, the distresses of the native peasantry have been often heart-rending; and the dishonest proceedings of some of the individuals to whom the distribution of the meat and potatoes, purchased by British generosity, and the contributions collected in Dublin, [illegible] been notorious. Some of them made fraudulent reports, an[illegible] deprived many of the famishing peasantry of that [illegible] whic[illegible] been sacredly devoted to the purpose [illegible] charit[illegible]ed that returns were, in some [illegible] appear that there were more [illegible] than there were mouths in it, [illegible] an enormous extent. And [illegible] [illegible]ices of this extensive county. [illegible] Ordnance Survey, 1,355,048 sta- [illegible] [illegible]ltivated, 425,124 mountain [illegible] water. For fiscal purposes, [illegible] [illegible]s, Tyrawly, Erris, Costello, [illegible] [illegible]allen, Kilmaine and Glanmorris,

which rank, as to superficial area, nearly in the above order; but Erris, though second in extent, is the poorest in soil and least populous. We shall take them, however, in the course most convenient to the tourist, supposing him to commence with Tyrawly.

Tyrawly, which is on the north-east division, contains 261,029 acres, of which a great deal is champaign land, and has the largest number of resident proprietors, who are in the northern portion. Generally speaking, there is very little timber in Tyrawly, though, in ancient times, forests abounded there as well as in other parts where now scarcely a vestige of them remains. But, as regards hedge-rows and plantations, it contains more than any other barony. From its great superficial extent and natural dissociation from other parts of this great county, some of the most intelligent of the land proprietary are of opinion that it ought to form with *Erris* a distinct county, with Ballina for the county town—or, at least, that these baronies should be incorporated into one riding, with the northern part of *Gallen* included. The level land, which is a brown sandy loam or limestone, for the most part gradually rises in a southerly direction from Kilcummin Head into heath-covered hills, between which are productive valleys, and those hills terminate in very high and bleak mountains. Though this barony is the most valuable, it is doubtful if the fair rental exceeds £10,000 a-year, and certain that no single proprietor has £2,000 a-year *clear* arising from his property there. The calcareous manures are plentiful; the reclaiming of bog and other waste land by their application has not been carried on with any energy, and certainly on undrained and deep bogs there would be little or no ultimate advantage in putting out limestone gravel or lime. But there is a great deal of shallow moor in Mayo, which, by breaking through the crust of clay, which is generally within nine or twelve inches of the surface, might easily be reclaimed with little expense; and yet much soil of this kind, adjoining a bed of limestone or a stratum of calcareous gravel, is left in a state of nature from the indolence or poverty of its owners.

The town of *Killala*, which, until the late suppression of bishopricks in Ireland, was an Episcopal seat, is close to Kilcummin Head, where the French landed from two frigates, and must have been surprised by the arrival of 1000 men, from whom the garrison of fifty men was obliged to fly, knowing well that the invading force would be rapidly joined by the peasantry who had been waiting their arrival.

Fishing, the collecting of sea-weed, and some employment in the manufacture of coarse linens, are the means by which the poor of the place are chiefly supported. The soil around is pro-

ductive. Though the actual coast is extremely bleak from its exposure to the Atlantic gales, yet the ruins of monastic buildings and castles, and a still surviving round-tower, eighty feet high, attest that communities of men had been established, and perhaps enjoyed life, in their bold and unsheltered stations. The want of any other harbour than that of Killala on the north coast of Mayo, operates against the local advancement, and the more so from the difficulty which large vessels experience in approaching the town; for no vessel drawing ten feet of water can enter the harbour except at spring-tides. The fishing, with hardly an exception, is carried on in open boats, from the deficiency of good anchorage and harbours along the entire of the north and north-west coast of Mayo, combined with the poverty of the inhabitants; yet there are fine fishing banks from Blacksod Bay to the north of Achill; and the great sunfish bank, which is thirty miles from the coast, and which extends, it is asserted, to the county of Kerry, has been a source of more loss than profit, from the uncertainty of good weather in the fishing season, which is about the beginning of May,—from the expense attendant on fitting out boats, and the loss of time to the men who have their farm-work to perform at the same critical season. The sunfish are assailable only during a few days, and *that* with a smooth sea. No wonder, then, if the quantity taken is inconsiderable compared with the cost, the inconvenience, and the dangers incurred in their pursuit. The bays and creeks of the west coast, however, afford sufficient security for the small open boats which are generally used.

Ballina is another little seaport in the same barony, south-east of Killala, and considerably up the river Moy, which separates Mayo from Sligo in that direction. The situation of this town is very romantic, and internal commerce is progressing there. The opening of an important road from Killala through Ballina, Foxford, and Swinford, has been already noticed. A short line of communication along the banks of the river to Ardnara, which is, in fact, a suburb of Ballina, though at the Sligo side of the river, has been formed by equal contributions from the commercial gentlemen of the two adjacent counties. Belleck Abbey, which belongs to Colonel Knox Gore, is the finest and best wooded demesne in the immediate vicinage of this picturesque town; and old ruins, and a cromlech in the same parish, add to the romance of the scenery.

So little part had that retired district in the national warfare for many centuries, until the Rebellion in 1798, that we believe the first appearance of any regular cavalry there to have been in the year '93, when a gentleman of our present acquaintance was sent with thirty men of the 18th dragoons from Castlebar to

llina, in search of the agitators of that day, who, under the signation of defenders, disturbed the peace of the neighbourod. The soldiers and their war-harnessed horses were objects delight and astonishment to the inhabitants, who treated m with such hospitality that they declined to make any charge the forage supplied to the horses. The officer himself was artered at Deel Castle, the well-timbered demesne in that day the late Lord Tyrawly, which is about four miles from the wn, and his men had a very pleasant time of it, among the ıd-hearted town-residents. There were no *defenders* found ere, and the only stains of blood which our young cornet ceived in that campaign were those which were daily shed on his white leathern breeches in his contests with the salmon ich were taken in the weirs every tide. His amusement conted in gaffing them from the water; and when we say that the lmon fishing at Ballina, next to that at Coleraine, is the most oductive in Ireland, it will be admitted that he may have had good deal of sanguinary work on his hands. Indeed the antities of all kinds of fish in that region of bays, and estuies, and loughs, is enormous, and might well induce any lover fish, or of fishing, to take up his abode there, even if he had other object in doing so.

Crossmolina is another market-town, within the division of county, and about six miles from Ballina, on the river el, which rises in Mount Nephin, one of the grandest vations there: part of that mountain is in Tyrawly, which y well be proud of its noble presence. The town is not rth any particular notice, yet, as many very respectable idences surround it, including the very extensive parks onging to Deel Castle, which is now the property of Mr St orge Cuffe, the locality has been considered advantageous a resident gentry, who find that a limestone soil, and shelter which Mount Nephin affords from the west winds to ir plantations and gardens, are sufficient temptations for lucing them to settle there. Judging from the number of ıools in and around the town, the education of the people is ısiderably progressing there. In a few years, the Irish lanage, which is the vernacular tongue of the peasantry, except in immediate vicinity of the towns, will give place to the glish, which the children are now acquiring rapidly in the cessible and civilized districts. There are several fine head of tle in the champaign parts of Tyrawly—chiefly a cross from native breed with the Leicesters—some good sheep, but ither turnip-husbandry nor thorough draining, except parlly by the gentry, are thought of as branches of agricultural actice. With the exception of what Major Gardiner of Farm-

hill has executed in draining, nothing worth notice has been done in this vast extent of barony. The actual farmers are as backward in every department of their occupation as can be imagined.

We now enter the wildest part of Ireland. The barony of *Erris* (containing 232,888 acres) which is accessible, notwithstanding the immense mass of mountain and bog that intervenes, from Crossmolina, by a road along the level through which the river Owenmore winds its way. Rocky barriers, excepting this one pass, cut off the entire barony from the interior of the county. The road conducts to Belmullet—a little town most picturesquely situated on the narrow isthmus which separates the bays of Broadhaven and Blacksod, and which might be connected, at the expense of £5,000, by a canal cut across a part of the isthmus where it is but 300 yards in breadth. The effect of this would be the facility to vessels of any size of entering Blacksod Bay from Broadhaven, and, with almost any wind, putting out to sea; whereas vessels are now often detained in the former bay for weeks. The neck of land called the Mullet, which stretches along the coast, north and south, fifteen miles, forms a natural breakwater against the western ocean, and renders Belturbet and its adjacent bays perfectly safe from its fury. Limestone is abundant in the eastern portion of the parish in which Belturbet is; and iron-ore, which is in the same district, has been raised and smelted, but, from the difficulty and expense of providing coals, the furnaces are no longer worked. Coal, however, is said to exist there, but neither the iron nor coal mines have yet proved valuable. Granite, which has been quarried for the pier at Blacksod, and other engineering works executed by the government, is found in the southern extremity of the Mullet. The trap-dykes and rich variety of minerals delight the geologist, while the antiquarian finds the records of Celtic worship at Enoll, with the traces of monasteries that had been founded in the early centuries of the church; and the admirer of the grand and terrible finds, on the west side, cliffs and caverns which are gigantic in their proportions. The whole of the coast scenery of Erris is inconceivably grand. For the finest view, Binwy Head, the elevation of which is 900 feet, is probably the best point. The objects from it, seen to perfection, are "the deeply indented shores of the Mullet, the bays of Blacksod and Broadhaven, with the towering Achill in the distance; to the east are the Stags, and the iron-bound range of coast between Binwy and Benmore, the Wedge and Downpatrick Head, with the Sligo shore and the mountains of Donegal and Arranmore, in the distance; to the north is the ocean; and to the south are mountains rising above each other in majestic grandeur. Near Binwy is

ral, and near that are the ruins of an ancient stronghold, of h only the gateway is remaining."*

he village of *Belturbet* originated in 1822, in the establish- t of a coast-guard there; and it was then rendered acces- from Ballina, which is thirty-two miles distant from Castle- and the effect of forming roads from those places has an increase of production in barley and oats *more* than ty-fold—a fact which speaks loudly to the legislature in ur of connecting other remote parts of the same kingdom with seaports and great inland towns. The connexion of the most ote part of Connaught with the towns just stated, and along ine of coast with Westport—nearly a length of sixty miles le latter direction alone—have been among the most use- of public works. The representatives of the late Major cham and Mr W. H. Carter of Castlemartin, in the county ildare, through an ancestor of each, who married daughters ir Arthur Shaen, a settler during the Protectorate, are the cipal proprietors of this vast barony, of which the single sh of Kilcommon contains 211,906 acres, of which between 0 and 10,000 are barren land, or under water, and yet the e of this whole parish is estimated at less than £9,000 a- . It comprises great tracts of unimproved bog and a large ortion of bare rock, and the heath-clad hill of Schanachabine, feet high,) which, though rich in grouse as Lough Curra- is in trout and salmon, are of very little value, in other ects, to the owner. There is, however, on the river Owen- a very productive salmon fishery; and the best angling hat fish, in Ireland, during the last week of July and the week of August, is at Bally, near the mouth of the Owen- .

e Mullet is principally in the parish of Kilmore-Erris, which very small parish in comparison of the other, and contains 30,000 acres. A great portion of it is arable, and good for feeding; but there is too much of that never-failing bog, hich Dr Lyons, the Roman Catholic Dean—the best agri- rist in the barony, and a respectable and independent in every respect—has obtained the credit of reclaiming a deal, in order to employ the numerous poor of his parish, afford them fresh soil for potatoes, which, alas! fre- tly fail there when the wetness of the spring prevents a y burning of the peat-sods, and also from the effects of nt storms breaking down the stems before they have ma- l their growth. To obviate the latter calamity as much as human ingenuity may avail, the potato-beds are run

* Lewis' Topographical Dictionary.

north and south, and elevated nearly two feet on the western sides; for it is found that, by affording to them this inclination, one part at least of each bed has some shelter and chance of succeeding. Between his two enemies—wind and water—the poor Erris peasant frequently loses his precious crop. The mode of tillage there is of the most primitive kind, but there is a peculiarity in the Erris *loy* or spade—Hibernice, *gowlane*—which (as the soil is light, and therefore easily dug) consists of two small spades attached to separate soles of wood, joining at the handle. They are each about three and a-half inches broad, and are about two inches apart; the length is fifteen inches; the handle is of the ordinary length of the common Irish spade, five feet. It seems to be an indifferent implement, but they say in Mullet that it is useful in the sandy and moory land. The sooner it gives place to a more effective implement the better; for it is quite unfit for furrow-draining, for which the common Connaught *loy* is the best implement that could be devised. The cattle are of the most diminutive breed, and the houses of the peasantry are small and miserable, consisting frequently of one room, of which the walls are dry stones at the base and sods above, covered with straw rushes or bent grass, (*Arundo arenaria*,) laid on rafters and couples of bog timber. The worst cabins are in this barony, and Burrishoole, Costello, Gallen, and Murrisk. The fences are constructed with materials similar to those of which the cabin walls are formed, but much lower, and with great irregularity.

Burrishoole, which comprises 146,991 acres, is the adjoining barony, and is bounded by the entrance to Blacksod Bay on the north; on the north-east and east by part of Tyrawly and Carra; and on the south by Clew Bay and Murrisk; and is extremely rugged and mountainous, and without any very distinctive character from that of its neighbouring district in general. The island of Achill, which belongs to this division, and is the largest on the coast of Ireland, has been rendered remarkable of late years from its having become the scene of Mr Nangle's missionary labours, and the nucleus of a Protestant community, principally, if not entirely, consisting of converts from the Church of Rome, who find their protection in their numbers, and the means of support derived from a reclaimed piece of land, which may be considered *there* a good example farm, and the colony is thriving; yet the poor natives do not appear to have benefited by what they have seen of new and improved practice. This island is also remarkable for the misery and degradation of the native inhabitants, and the unfruitfulness of the soil. The length of the island is sixteen miles, and the breadth seven, and of this large tract, comprising 46,000 acres, the Marquis of Sligo and

rd A. O'Donnell are the proprietors, but the former has
nall portion of it. The latter is doing much towards
ovement of Achill. He is promoting furrow-draining,
ulture of green crops generally, on his property; and it
g to see that he has been a recent competitor for one of
medals of the Royal Agricultural Society of Ireland,
rrow-drained 124 acres in another part of the county;
lifficulties in his way are almost extreme. Some por-
the waste lands, where the levels afford drainage, are
le; but there is little calcareous gravel in Achill. The
s of Slievemore and Menal Hill are on the island, and
ional severity of the climate on the sea side may be well
. The liability of the crops to blight, from the sea-
ill always be a cause of apprehension to any persons
g money and labour on tillage there. But it appears to
stionable that the soil might be rendered much more
e for rearing cattle and sheep by deepening the beds of
ms, and thus obtaining drainage. The quantities of
; might be raised without any risk of failure in the
uch as are capable of being sufficiently drained,) by
the ashes obtained on the spot, and the sea-weed which
liarly excellent for that plant, are incalculable; and
s would, in their various results, benefit the population
than they have any conception of, by enabling them to
uch greater number of stock. The introduction of a
scription of cow is attributable to Mr Nangle and his
ho labour under the disadvantage, not only of the want
one gravel, which, though found more or less in all the
of Mayo, is not in Achill, or, if so, in a very limited de-
l which is so remarkably efficacious in the reclaiming of
rs—nor is the limestone of Achill of good quality.
ry at the sound of Achill is not more than a quarter of
breadth. There is a hotel on the townland of Potha-
he mainland side of the sound. This lonely place is
es from Mullrany, which place is eleven miles from New-
ng the direct road, and the only pass between the
of Coraan, which is 2,254 feet high, and the sea; and
pass has been found the *Erica Mediterranæ*, which was
to be indigenous to the shores of the Mediterranean,
Mackay found it a few years ago in Connamara, which
same coast.
north side of the entrance of Clew Bay, and separated
hill by a passage fordable at low water, is the little
Achillbeg, (one out of hundreds of islets on that coast,
rom 2 to 200 acres,) containing 200 acres, the greater
which is rocky pasture; and between that little island

and the promontory, on the south-west extremity of the other, known by the name of Achill *Head*, vessels of moderate draught find in the channel of Achill excellent anchorage in all weather.

Newtown Pratt, which is at the north-east extremity of Clew Bay, and on the fine salmon river called the Burrishoole, which enters the bay at that place from Lough Feagh and Lough Furnace, is the principal market-town, and part of the barony of which Sir R. A. O'Donnell is the principal *resident* proprietor. It presents a very creditable appearance, has good quays, and a pier, and safe moorings for vessels of 200 tons; yet the trade which it formerly possessed has been, in a great measure, transferred to Westport, which is at the south-east extremity of the same spacious harbour, which is eight miles in breadth, and at Westport twelve miles in depth. The reason for the preference given to the latter port is, that it has a direct communication with a much greater extent of cultivated country. The residence of Sir R. A. O'Donnell is near the town, within three miles of which is also a small square tower, built by Grana Uile. With the exception of the country immediately about Newtown Pratt, the barony is extremely mountainous and rocky; and those elevations to which we last referred were entirely inaccessible to all but pedestrian travellers until within a few years. In the valleys between those high lands, and wherever it is practicable, rude tillage is pursued. In the parish of Burrishoole, (in which Newport Pratt is situated, containing 12,550 acres, and about the same number of inhabitants,) almost all the land is under cultivation; and many of the islands of the bay, which are included in the parish, support a great many sheep. The adjoining parish of Kilmina, containing 1000 acres, and about 1100 inhabitants, is returned as worth 15s. per average acre, there being but a sixth-part of that parish bog and waste. The islands in the creek which runs into that parish are numerous, and some of them interesting, from having monastic ruins and a considerable [illegible].

[illegible] a good deal of thorough-draining in Burrishoole [illegible] two or three years, and principally on the holding[illegible]; and the Marquis of Sligo, Sir R. A. O'Donnell [illegible] have introduced the culture of green crops in[illegible] well as that of

[illegible] comprehends an area of 137,061 acres, and [illegible] Westport, in which there are many excellent [illegible] a superior hotel, which was built and furnished by the Marquis, and is given free of rent by the present [illegible] the person who conducts it. On each side of the [illegible] there [illegible] made planted in the continental

nner; and the demesne of the Marquis, who is proprietor of town with its fine plantations, has a beautiful appearance to se who approach the town from Castlebar; while that grand-of all the Irish mountains, Croagh Patrick, of which the ire circumference at the base is fringed with trees, and the y mountains of Achill and Erris in the distance, with Muil-, the highest in the province, at the south-east termination of barony, and Killery Head, a very bold and striking eleva-n, and two mountains, the one 2,280, and the other 2,283 t, rising close behind its competitor to the eastward, add their jestic proportions to this scene of grandeur, and add their nbined effect to the very different panorama which Clew Bay l its numerous islands, and the mighty volume of waters in adjacent ocean, present to the astonished eye. Then there is fishing lodge at Delphi, in a gorge of the mountain, sixteen les from Westport, with Muilrea in its front, and Bencraggan d Bengomm rising behind it; with its loughs, Dhuloch and nloch, and mountain-streams outflowing from them to the sea. is is the very perfection of a sporting lodge. The Marquis of go has let it to the Hon. Messrs Plunket, who, of course, pre-ve the fishing—and noble sport they enjoy there, as may be derstood from the following facts:—A party, consisting of four glers, viz.—two of the Messrs Plunket, *the* O'Gorman, (the eftain of his clan,) who is known as the most skilful angler in land, and that celebrated sportsman, Mr Joe Atkinson, killed, the course *of one day* on Dhuloch, as many salmon and white ut as filled the panniers of a pony and baskets for two men; l one gentleman had killed, a short time previously, from one k, nine salmon.* It is on the sheep farms there that Lord go has brought the Cheviot sheep.

When it is remembered that in this county—amidst magni-ent scenery, where

> "The mountainous region is rich in 'sma' stills,
> No little inducement to take to the hills,"

l a very quiet and inoffensive population resides—where excel-t sport, plenty of fish, and the sweetest mutton, with all the essaries of life, may be obtained at a very moderate price, l, moreover, where agreeable society might be formed by care selecting and locating families of corresponding circumstances l congenial habits, it is a matter of wonder that some of se emigrants who go to provincial towns on the Continent, do try some parts of the west of Ireland in preference.

Such sporting as our countrymen cannot obtain on any part

* A great advantage enjoyable by the angler there is, that if the wind renders ing unfavourable on one of those lakes, it always facilitates it on the other.

of the Continent with which we are acquainted, and social intercourse between families of congenial habits, might be got as economically there as abroad; if people would have the good sense to adopt at *home* the temperate habits and simple style of entertainment which they would (if bent upon economical practice) pursue abroad.

Westport, like Erris, has attained a melancholy celebrity from the notorious misery of the surrounding population in times of scarcity, when they must have starved if the hand of the Englishman had not been extended to them in pity.

To vary the dry tone of statistics, we shall relate a circumstance which occurred—in one of the years of remarkable scarcity along the coast, and when the late Archbishop of Tuam, Mr Budsworth Palmer, and Mr Thomas Lindsay, set such noble examples of active benevolence—to an officer of the —— regiment, who was sent from Westport to Ballinrobe in charge of a detachment of four men who had been sent as an escort with a cart-load of meal for the poor of Ballinrobe. A great assemblage of the people of Westport, however, being themselves in a starving condition, suddenly appeared on the road by which the little military party was advancing in perfect unconsciousness of the meditated attack upon them. At first an assault was commenced on the sacks in the carts by women, who ripped open one of them in a moment, and filled their aprons, while some of the men held the horse. The officer, finding remonstrance useless, and determined to execute his trust, prepared for action, and ordered one of the soldiers "to shoot the fellow who held the horse;" and such was the consternation which affected the mob when they saw one of their leaders shot dead, that they retired in all directions, instead of overpowering the guard, as the officer might have expected, in retaliation for the bold and decisive act which he had committed. The assailants, who were very numerous, were content to carry off the corpse of their companion, and allowed the escort to proceed unmolested to their destination. The officer was obliged to take his trial for the homicide, and even to pass some days in gaol previously to the assizes at which he was tried. The soldier-like straight-forwardness and simplicity of his answers to the questions put to him in court were not [illegible] characteristic and amusing. One of these was:—"What did [illegible] happen to you when you gave the order to [illegible] who had seized the horse by the reins?" "I said [illegible] ied, "the house of F—— is gone for ever."

[illegible] native lands in the barony, Mr Garvey of Mur[illegible] which are the remains of the old monastic [illegible] urris[illegible] where the O'Malleys, O'Donnells, and [illegible] families [illegible] resting-place is the principal

rietor. We are not aware of any general improvements rtaken by him. He was, perhaps, the first person to intro-, on his own farms, an improved kind of black oats, which been largely cultivated since in that locality.

patron, still held, though with diminished zeal, at Murrisk, ie 28th of August, has none of the solemnity of a religious rvance, though it was originally designed for the refreshment lgrims from the reek of Croagh-Patrick, which towers in its sty over the demesne of Murrisk, and is the scene of annual nces and pilgrimages on its flat summit, where a rude stone —probably the erection of druidical superstition—and the iins of a rude sort of chapel, mark the place from which St ick, according to the legends, banished all the venomous iles of the kingdom into the sea. The poor votaries of cre-y at this day crawl round the stone, on bare knees, until they ly faint from fatigue and exhaustion. They then leave some er money on the holy stone, and hang some rag from their s upon a white thorn bush which grows near the spot, and sh themselves with (or used to do so) a little whisky, which occupier of an adjoining hut, during the pilgrim season, sup-l to them. The individual who took up his summer abode e, in our more juvenile days, was a singular looking ascetic, d Bobby of the Reek—so venerated by the natives, from his association with the hallowed peak of Croagh-Patrick, that or O'Malley had no difficulty in persuading them to carry orpse, some years ago, from Murrisk to the pinnacle of the ntain, where it was interred. The enthusiasm of the multi- which bore the bones to such a wearisome and difficult t must have been very highly wrought.

iere is a holy well on the lands of Lacamby, on the road from tport to the neat village of Lewisburg, to which hundreds of ims resort on their return from the reek. What is called *patron* at Murrisk partakes no longer in any degree of the nities of a religious fete, but is an ordinary fair, with the l attendance of fiddlers, pipers, fortune-tellers, and gamblers, hich, however, many of the gentry of the country afford their ence, for the sale or purchase of live stock, and the partici-n of a good collation at Mr Garvey's mansion-house, while iumbler natives regale themselves after their own fashion. Lindsay, already noticed for his observation of the duty of a lord in attending to the cry of a starving tenantry, has not inactive as an agriculturist in this barony. He deserves, ed, the appellation of a *great improver* in that region of indo-e; for he has been, during many years, a systematic cultivator irnips and other green crops, and has latterly commenced ow-draining on a very extensive scale. Yet there seems,

except with a few enlightened men, a strange indifference here as elsewhere, among the farming classes, to make much use of the bountiful stores of lime with which Providence has blessed them: nay, some of them have taken it into their heads that, if it be of inferior quality, or combined with magnesia in any proportion, it must be injurious to the soil. No doubt that which contains magnesian earth is the least valuable, and, according to Sir Humphry Davy, injurious if applied in a *caustic* state, though not so in small quantities; but, certainly, it is beneficial when used in the carbonate state; and we are disposed to think that, for *peat*, which forms so great a portion of the soil of Mayo, magnesian lime is most efficacious. The prevailing Connaught practice of burning land, without applying any manures afterwards, has produced its deteriorating effects.

Carra contains 146,816 acres, and possesses some exquisitely fine scenery; indeed the views about Pontoon Bridge, and the district which bears the same name, is sufficient of itself to attract the traveller to Connaught, and the country about Castle Carra, (on Lough Carra,) the property of Sir R. L. Blosse, Bart. The lake, which is seven miles long and three wide, is dotted with islands which are clothed with wood; and in the small rivers which flow into it, as in the lake itself, the angler finds excellent sport. Probably the grandest mountain scenery in the county is to be witnessed in this locality, where the Partree Hills, and the range of the mountains which overhang Delphi, form splendid boundaries. A good deal of the soil is light and sandy, and well suited to turnips; and in some parts, as at Burriscarra, a parish within a few miles of Hollymount, there is little bog; and, altogether, the country about the lake is highly improved, and very much ornamented with gentlemen's seats. The parish of Turlough contains some land of very good quality—limestone being the basis—and is making some little advancement in the mode of agriculture. Judging from the number of national schools in this parish and elsewhere, there is ample provision for the education of the people, though the R. C. Archbishop of Tuam has opposed the government system with all his might, as too scriptural, while the clergy of the Established Church have objected to it as not sufficiently so. There is an extensive bleach green at Turlough, and the domestic manufacture of coarse linens, diapers, flannels, and woollen stockings, gives employment to the peasantry. Nor are such industrial works confined to any particular locality; for every humble occupier of land sows flax-seed on, at least, a few headlands, to supply the material of the strong and durable linen which his family require, and which, except the weaving, is prepared under his own roof: and poor indeed must [illegible] peasant who has [illegible] sheep [illegible] two to yield the wool

required for his coat and stockings, and flannel for his wife and children; though, when the miserable condition of the *genuine cottier* is in question, whose hard labour is for the benefit of some griping superior, we fear that he is so closely shorn himself, that even the wool of the "one little ewe lamb which the poor man had bought and nourished up" can be hardly considered his own property, and that the words of the poet—

"Sic vos non vobis vellera fertis oves"—

would, metaphorically, be as applicable to him as they are literally so to the fleece-bearing animals themselves.

Kilmaine contains 105,988 acres, of which the greater part is excellent for feeding sheep, particularly about Ellistron, where the soil is calcareous; but the visitor who regards the face of the land with a farmer's attention, sees many large tracts of reclaimable bog, almost in contact with limestone, which is not used; though it is beneficially placed there, as if to stimulate the industry of man to his own good, by the bountiful Creator.

The large parish of *Ballinrobe*, which is bounded on one side by Lough Mask and Lough Carra, is one of the most interesting parts, not only of this barony, but of Mayo. In the direction of the lakes (which have the noble elevations in Tayee's country, —C° Galway—stretching beyond them to the west,) are many embellished and well-cultivated demesnes; and, to the east, there are many varied and beautiful objects for the eye to contemplate, among which those that are visible from Carramore—the seat of Mr Martin—are perhaps pre-eminently striking. The historian feels an interest in examining the village of Cong, which, though now an insignificant place, was formerly the residence of the kings of Connaught. It was in the monastery founded there in the seventh century that Roderick O'Connor passed the last fifteen years of his life. At the commencement of the thirteenth century, both the monastery and the town were plundered by one of the Burghs; but some of his successors made compensation for the outrage by endowing the abbey with lands and wealth, and it continued to be very richly maintained until the reign of Elizabeth, who granted the greater part of its estates to an ancestor of the Earl of Kingston. The scenery about Cong, particularly at Strandhill, (Mr Ellwood's,) and Ashford, (the property, but not the residence, of Lord Owenmore,) and, though not within the limits of the county, the demesne of Rosshill, (belonging to Lord Leitrim,) is very fine. One of the greatest natural curiosities of the country is the subterranean flow of the waters of Lough Mask into Lough Corrib, which is on a lower level.*

* The respective levels of these lakes are as follow:—Lough Mask, in summer 64 feet, and in winter 72 feet, above the sea; Lough Corrib, in summer 28 feet, and in winter 31 feet; Lough Corin, in summer 37 feet, and in winter 42 feet.

One of the fissures in limestone rock admits of a descent, by seventy steps, to the bottom, where the surprised and delighted spectator sees the rushing stream flowing in its under-ground course through the openings of the rock.

Lough Corrib is navigable for twenty miles in the direction of Galway, and might be rendered so to that town; and the junction of those three lakes with each other is very practicable by means of locks; but it is doubtful if the advantages that might be derived from such communication would be sufficiently remunerative. The river Blackwater also, which, for a short distance, forms a boundary between the counties of Mayo and Galway, disappears under ground for three miles in the neighbourhood of the village of Shrule, then reappears and flows into Lough Corrib; and the river Aisle has a subterranean passage in the same way. Hollymount, one of the most pleasing country towns in this county, is in this barony; and near it is the well-timbered lawn of Mr Spencer Lindsay, who is one of the most improving proprietors. That gentleman has cheeses made in his own dairy, which are sent to Yorkshire, and considered equal to those of Cootherston. Instead of the stone and sod fences so universal in other districts, Kilmaine exhibits thorn hedges, growing in the favourite Irish manner in the breast of clay banks.

Clanmorris comprises 69,252 acres. The preceding remark applies to this barony in a great measure, the fields being well fenced with hedge-rows; and we may distinguish the parish of Crossboyne, as not only the most civilized looking part of Clanmorris as to houses, shelter, plantations, and uniformity of fields, but as equal in these particulars to the parishes of Robeen or Hollymount in Kilmaine, and of Turlough in Carra. 50,000 perches of covered drains have been executed by Mr Lambert of Brooklawn, which is a very spirited commencement, and the work of all others most likely to be emulously imitated; for it is, in truth, the basis of all improvement—the elementary step—after which all other movements will progress with rapidity. As a means of affording employment, also, such examples cannot be too strenuously recommended, more especially in a province in which the labour of man does not exceed 6d. a-day during winter, and 7d. or 8d. in summer. Indeed, one would suppose that, with such economy in the item of work, the temptation to draining would be irresistible to the landowners and independent tenants. Mr Lambert has been, for twenty years, celebrated as the most spirited and judicious breeder of cattle in Mayo. That gentleman, notwithstanding the new tariff, obtained last year, at his sale of short-horns, higher prices than were ever before known in the county. One cow and calf were sold for 60 guineas; twenty cows for 545 guineas; and twenty heifers for 503 guineas. Lord Lucan, by

the way, has imported cattle from Switzerland, and has commenced breeding short-horns. The Marquis of Sligo has introduced Kyloes and Cheviot sheep. The Bishop of Tuam, too, and his brothers, the Hon. Messrs Plunkett, have brought to their summer farm, on Lough Mask, (where their improvements on a mountain are most creditable to themselves, and useful to the country where such exhibitions of skill and taste appear,) the West Highland cattle, which appear likely to succeed, though they are liable to a rheumatic disorder at first, which the natives call the *wuppane*—a term certainly unknown to our veterinarians.

The little town of Ballagh, on the estate of Sir R. L. Blosse, (a minor,) is very neat, and his present family mansion is near the town. One of the four round towers of Mayo is at Ballagh, and though the upper part is wanting, the walls are still fifty feet high, looking down, as it were, in mournful contemplation on the ruins of a church which possibly may have been coeval with the tower itself. A holy well, dedicated to the Virgin, draws its crowd of *patron*-pursuing zealots there in the autumn of every year. The soil in this part of the county is at least equal to that in any other, and the supply of limestone is inexhaustible.

Costello, which contains 148,197 acres, is on the borders of Roscommon, and, on the N.E. limit of the county, has more of unreclaimed bog in proportion to its extent than any of the other divisions. In the parish of Kilmore alone, which has 20,000 acres, 8,500 are reported to be bog, and the remainder is mountainous and barren. The parish of Castlemore, which is much smaller, has one-fourth of its area under bog. A great part of the barony is mountain, belonging to Lord Dillon, who, if his Lordship cannot boast of fat bullocks, has a fair supply of grouse ; but this nobleman has also a good deal of land in his barony very capable of improvement. Limestone, however, is not plentiful, at least in the parish of Kilcolernan, which comprises a very large tract, and this is one cause of the poor condition of the tenantry.

There is an improving little town called Ballaghadoreen, in Costello, on the high road from Ballina to Longford, and within twelve miles of Boyle. It is greatly to be desired that, in such extensive tracts of land in a state of nature as we find in Costello, some means might be adopted to the mutual advantage of landlord and tenant, and through which the latent resources of the soil might be developed. Mr Lambert, whom we have noticed already as a valuable member of the agricultural department, has recently published some sound practical suggestions in the *Irish Farmer's Gazette*, among which he proposes that the tenant should receive two-thirds of the actual value of any

permanent improvements he might make—one-third to be paid by the proprietor, and one-third by a general improvement fund, which, with judicious premiums from local agricultural societies, would afford a wonderful stimulus to an expenditure of labour by the occupying tenants. Sir R. A. O'Donnell, who has been one of the four most extensive of thorough drainers in Ireland during the last year, has placed at the disposal of the Agricultural Society of Ireland a gold medal, for the proprietor in Ireland who shall execute the greatest quantity of thorough-draining on land *in possession of tenants, and through their instrumentality and co-operation.* This, as the editor of the *Gazette* well observes, "is well calculated to establish the principle of uniting the capital of the landlords with the labour and co-operation of the tenants for their mutual good."

Gallen, 119,392 acres, has nothing to distinguish it from other poor tracts. The principal town within it is Foxford on the river Moy, near which very indifferent county town is a rock which bears Cromwell's name, in commemoration, it is supposed, of the passage of his army across the river, at a point very near which there are the ruins of a large monastery. There is also a small market town, named Swinford, within its confines, on the road from Foxford to Ballaghadoreen. The soil is very poor, and is occupied by a pauper population; nor are there any symptoms of approaching improvement in any essential respects. No traveller passing through this dismal district, and in search of a settlement, would ever think of stopping there, unless for the sake of angling.

The present proprietor of an estate in Gallen obtained it in a singular manner. He was one of three brothers (of whom one has been a distinguished officer) who were sons of a gentleman of independent property in another part of the county. When the brothers were boys, and in their father's house, an uncle (who had about £1500 a-year in Gallen) observing one day that the eldest son only was privileged to drink a glass of wine after dinner, asked the father why the second son, to whom he had taken a fancy, was not treated in the same way; to this the father replied, that as the two younger boys would probably never be rich enough to drink wine, he did not think it prudent to accustom them to the taste of it. Then, said the uncle, somewhat in the mood of Captain Absolute—"D—n me, sir, if Andrew shall not be better able to drink wine than your eldest son." To keep his word, and indulge his humour, he left to Andrew the aforesaid property in Gallen.

This barony, however, is not particularly miserable, though we have less to remark in favour of its appearance than in many other parts of the county; for ... it is not shewing any symptoms of re-

generation. The poor mountain farms are only fit for the rearing of black-cattle and an indifferent description of sheep; yet, excepting Clanmorris, Gallen is the most grassy division of Mayo. Dairies, however, are not numerous, and the few that are kept are on a very limited scale; and, on this account, pigs are not reared and fattened there, nor indeed in the county at large, to the same extent as in other counties.

It is difficult to say whether the want of energy in draining and manuring with lime or calcareous gravel the waste tracts in Mayo generally proceeds from want of confidence in landlords, who have it in their power to increase the amount of rent from improving tenants on the expiration of their leases, (usually for twenty-one years, or one life,) or the want of capital, or a due estimation of the results of improvements. Perhaps all these causes combine to keep matters at a stand. Though the farms in the grazing districts are in size from 100 to 500 acres, the occupiers have a decided disinclination to expend money even in furrow-draining, which would be inexpensive to tenants who, in so many cases, would be able to bestow at least some surplus hours in every season for such a needful purpose; and employment in this way, with spade-trenching afterwards, would bring profitable employment to the family of the humble small holder, who, in the long run, would find it far more remunerative *to dispose of his labour to himself*, than to other persons at the miserable rate of wages now obtainable in Connaught.

The investigation of the commission under the presidency of the Earl of Devon may lead to some legislative enactments which may give confidence to the industrious and enterprising tenant who feels inclined to lay out his capital—even though it be only the sweat of his brow—on the amelioration of his land. When the small families of the country, who constitute so vast a proportion of the population, begin to see the beneficial consequences of draining and trenching, they will not, for their own sakes, persist in neglecting such operations.

In the sandstone and peat districts of Mayo, and wherever the *detritus* of limestone rock does not constitute a portion of the soil, the application of lime would be most beneficial; yet the Mayo farmers do not seem aware of the advantage which they possess in having such inexhaustible supplies of this great element of improvement, either on their own farms, or within such a distance as the combined exertions of landlords and tenants, in forming railways, might render no obstruction to their obtaining the necessary quantities. Landlords, however, must commence, and principally defray the expenses of such operations, which they would not find alarming in amount, by a judicious understanding with their tenantry, who would contribute *free labour*, and

money also, according to the circumstances, and the probabilities of ultimate benefit.

The average amount of rents paid by the grazing farmers of Mayo is less than that paid by the small holders—the average of the former being, according to the calculations of competent judges, 20s. per acre, while that of the other does not exceed 17s. 6d. for second class land.

In conclusion, we are inclined to believe that one of the first improvements which would be remunerative in Mayo would be the sinking of the beds and fords of small rivers, to give the necessary facilities for furrow-draining by forming the main vents, and then we should recommend the furrow-draining and subsoil-ploughing, or spade-trenching, of all the wet rushy land based on a stratum of calcareous gravel or marl, the value of which might be doubled or trebled.

The greatest extent of wild but improvable soil is possessed by the Marquis of Sligo, Lord Dillon, Sir Roger Palmer, and Sir Robert Lynch Blosse; but, in the most advanced districts, there is a vast deal to be executed in draining and trenching.

D.

ON THE CHARACTER OF THE WET AND DRY ROT IN THE POTATO.*

Formerly potatoes were only cultivated on the small scale. They began soon, however, to be raised in such quantities that whole fields were required for their production—every tenant began to cultivate them largely; first, because they served him not only as food for his cattle, but as a means of maintaining his family; and, secondly, because he was enabled to raise a large quantity of them with little trouble and at a moderate expense. The success of the potato crop is generally more certain than that of any other; for, very frequently, when all other crops give only a trifling return, or even entirely fail, the potato crop yields a comparatively large produce. This, however, is only an immediate advantage; but, in addition to this, the potatoes, when given as food to cattle, increase the quantity of manure which they yield, and this produces to the farmer an additional profit in the quantity of organic matter which, by means of this manure, is

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* [illegible] *[illegible] ohüife, Von Herrn. Fr. August [illegible]ckert*, published [illegible] [illegible]mar. Translated from the German by Mr W. H. F[illegible] [illegible] Second Assistant [illegible] Laboratory of the Agricultural Chemistry Association.

added to the soil, and which vegetable matter, again, has a very favourable influence on the crop which is next cultivated; so that, in our time, there is no plant which is so sure to succeed when cultivated, and, at the same time, to bring in so large a return to the agriculturist, as this noble vegetable.

Potatoes are raised in still larger quantities in places where they are employed for the manufacture of brandy. This mode of employing the crop brings in a large income both to the manufacturer and to the farmer who raises the potatoes. The cultivation of the potato crop in such places also enables the agriculturist to rear a greater number of cattle, and thus to increase the quantity of his manure; besides, the cultivation of potatoes to this extent always causes the soil to be kept loose and free from weeds to a considerable depth, and, by these two circumstances, the fields are much improved, and rendered more suitable not only for seed crops, but also for those crops which are subsequently cultivated as food for cattle.

In rugged mountainous countries, which are in general unable to produce any of the more noble descriptions of seed crops, potatoes may be easily raised, and the inhabitants always look upon them as a certain means of support. Mountains, which are in general unsuited to the cultivation of most other kinds of plants, every year produce potatoes; and though the potato is a plant which, in its natural state, is never found upon hills, yet the crops of potatoes cultivated in mountainous countries, are invariably found to be of better quality and larger in quantity than those raised elsewhere. Such a source of support as the potato is of great value to the poorer inhabitants of those countries where, before its introduction, they often had to struggle against hunger and want. And, as the manure yielded by their few cattle is collected and applied to the soil, it is not uncommon for the inhabitants to grow potatoes upon their fields every year, inasmuch as this crop repays them better than any other. No other plant can support the inhabitants of these mountainous districts so cheaply as the potato, and upon a good crop of this vegetable depends exclusively the comfort of their inhabitants. Notwithstanding all these amply verified and manifold advantages, which make potatoes indispensable in so many instances, the cultivation of this plant is performed in an exceedingly careless manner, and the old methods of culture remain unaltered, because the potato generally yields tolerably good crops, when other plants, cultivated in the same manner, give only a scanty produce. However, just because we have been inattentive to the hints of nature, and have continually exposed the plants to the same old and bad system of cultivation, we have in the end come to such a crisis, that we hear from all countries the dismal intelligence that potatoes do not now, as formerly, produce good crops.

Although it certainly has happened in former years, in many places, that single potato bulbs rotted and spoiled, still it is only within the last few years that the malignant and destructive potato-rot has commenced, which now causes the farmer so much apprehension. We shall, in the following pages, give the history of this so-much dreaded potato disease, the places where it exists, and its symptoms as they are observed in different places. This disease consists of a dry and a wet rot, and has been particularly observed in Germany.

1°. *Extent to which the disease has been observed.*

In *Bohemia*, the "Patriotische Oeconomische Gesellschaft" (while calling for a clear explanation of the cause of this disease) says—"For some time past there has been observed here a disease hitherto unknown amongst the potatoes. It is believed to be occasioned by an insect, which has called forth the greatest attention on the part of the farmers of foreign countries, and which we also must investigate, inasmuch as it has been observed in the northern mountainous countries of Bohemia."

In *Saxony*, particularly in the departments of the *Erzgebirge* and *Schönburgischen*. In *Russia*, particularly in the provinces of *Pomerania*, in *Saxony*, *Silesia*, *Westphalia*, and in *Rhenish Prussia*, the disease prevails. From the mountainous country of the *Lower Rhine*, intelligence has been received that, for some years past, a disease has been observed amongst the potatoes, which has caused the failure of half the crop in many fields.

In the "Verhandlungen des Landwirthschaftlichen Kreisvereins Altena," in the county of *Arnsburg*, (province of Westphalia,) are the following remarks upon the failures of the potato crop:—"In the year 1840, it was observed in many places in the *Thuringer Walde*, and also in the *Erzgebirge* in *Saxony*, that the potatoes which were cut in pieces did not grow, but rotted away in the soil. In the previous year, 1839, some farmers had made the observation that potatoes planted whole did not germinate, and that those which were cut also rotted, and they believed that this phenomenon was caused by a disease in the potatoes, which has this year made more progress, and which, for this reason, calls for great attention in reference to next year." Another person writes thus from the *Thuringer Walde*:—"Although the mode of treatment during [illegible] cultivat[illegible] [illegible] been the same as in former years, and notwithstanding [illegible] the favourableness of the weather, the potatoes [illegible] or the whole field have failed either partially or altogether [illegible] sometimes also the potatoes upon a portion of the field [illegible] soil close beside it was quite bare, and [illegible] another place, again, only a few plants were to be seen; and [illegible] notwithstanding these differences, the soil was equally manured [illegible] same kind of seed [illegible] used and the [illegible] ting out was

performed upon the same day." The owner of this unsuccessful potato field afterwards bought and planted out potatoes of known good quality, but without success. During a journey made last year in the Duchy of Altenburg, a field was mentioned to me, upon which all the potatoes planted out had failed, and upon which, a second trial being made, the same result ensued. Both cut and whole potatoes had been employed on these occasions. In the year before, the potatoes on the same estate had also failed, which was probably occasioned by the potato disease. This was also most likely the case with other properties, inasmuch as many fields of potatoes in that country had been observed to be very bare, owing to the seed-potatoes never having germinated. The disease caused great consternation in this country, as the malady had infected all those potatoes which were left. Many tenants were obliged to plant their potatoes twice or thrice. It even occurred, on some spots, that, notwithstanding this repeated planting, the potatoes would not germinate at all, but rotted away as soon as they were planted. This circumstance was one of greater pecuniary importance to those farmers who had to buy their seed potatoes. These facts all tend to prove that the failures of the potato crop which have been noticed to prevail during the past year are not due to the dryness of the season, but to a particular disease in the potato itself.

In *Bavaria*, particularly in the district of *Pfalz*, the potatoes are said to "rot even sooner than they did six years ago; and still every means has been taken in the hope of discovering a mode by which this rotting might be prevented. With the view of effecting this, potatoes were sent for to the other side of the Rhine; but they proved to be just as bad as our own, and half of them failed." Dr Zierl also mentions this disease of the potatoes in the Bavarian "Centralblatte des Landwirth Vereins."

In *Austria* and in *Prussia*, particularly in *Gera*, this disease has also been observed; and I had ocular demonstration to convince me of the truth of this during a journey I made through the latter country. I observed that, in many potato fields, there were a number of spots upon which no potatoes whatever were to be seen, and even when the *mother potatoes* had grown, they appeared to be very sickly, and the bulbs from them were of very small size. Upon many fields not more than half the potatoes which were planted had germinated. This circumstance was not occasioned by the dryness of the weather, as the same thing had been observed for some years previously, though it prevailed to a far less extent. It was, however, a very agreeable sight for me to see, in the midst of all these bad potato fields, one field belonging to the celebrated chamberlain, Von Mentzch, growing

with the utmost luxuriance, which shev ... be effected by a rational mode of cultivation. On the co ..., it was plainly to be seen in the before-menti... d fields that an erroneous method of culture had been the ... of the existing disease.

I was informed that, in different places, many tenants who, in previous years, had raised several hundred pecks of potatoes, had this year (1842) scarcely obtained more than from twenty to thirty pecks, and these few they were forced to use as food for their cattle, and were consequently obliged to buy new potatoes for their next planting, which also failed, and that this had now been the case for the last two years.

In the provinces of *Hesse* and *Nassau*, the Burgomaster of Offenbach writes as follows :—"A disease has for some years past been observed in the potato, which, in former times, was never, or, at all events, very seldom seen. The consequence of this disease has been, that the said potatoes did not germinate, and a failure in the potato crop, of course, ensued, which in many places was so extensive, that only half of the usual produce was obtained.

In the *Duchy of Mecklenburg*, and also in the Duchy of Anhalt, the following remarks are made concerning the disease of the potatoes :—"In many places in the north of Germany the produce of this year's (1842) potato crop has been much complained of, and even in those places where the harvest was large, the potato bulbs were so bad, that they could scarcely be used for feeding cattle. The crops were in general small, and this failure was occasioned more by the epidemic disease than by the dryness of the weather." Another writer says—

"In many places in the north of Germany, some years back, complaints were made of the degeneration of the potatoes, and to this has now been added the miseries of a remarkable and wide-spreading potato disease. This is a great misfortune, when we take into consideration the fact that the lower orders are all almost exclusively fed upon potatoes."

"Great care is requisite in order to prevent the spread of this disease of the potatoes, or, as it is called, cancer of the fruit. In many provinces of Germany, both the wet and the dry rot have been observed to prevail, and both call for great attention on the part of the farmers. Should this potato disease, together with the scarcity of wood, farther increase, half the population of Germany will be forced to emigrate to America. In the years 1780 and 1782, there was also a potato disease, but only of the stems and leaves; the present, however, affects not only these, but also the bulbs."

In *England* and *France* this potato disease is greatly complained of.

Denmark, *Sweden*, and *Norway*, it is likewise observed—n many places in Germany, as also from Sweden and Den- the most alarming complaints have been made of it, and of d effects which this degeneration of the potato produces he health."

he *Russian* provinces, on the shores of the Baltic, there has ear (1843) been obtained a very small crop of potatoes, failure has been caused by the potato disease. The seed- es, which were procured from other places, and originally y, were found to be likewise affected.

m *America*, the following has been written:—"America, *otherland* of the potatoes, at present obtains its seed- es from Germany, because their own would germinate ger. This experiment has hitherto succeeded very well, is now a question whether or not the American potatoes grow with equal success in the German soil."

internal disease of the potato makes itself known by per- obliterating the whole internal organic structure of the plant. This internal disease is of two kinds—the *dry* and *t* rot. The potatoes are either destroyed by one or other e two kinds of rot, or else the disease causes the decaying f the potatoes in the soil, without their making any effort reproduction of new plants.

signs and characteristic marks of this disease are of s kinds, and shall be described in the following pages, as I , and many others who have had great opportunities of ing the disease, have found them.

The signs of the dry-rot.

essor Kohlert of Prague says—"We have termed the dry- the potato a *cold combustion*, and it consists of a complete g away of the bulbs, caused by a gradually progressing in the organic structure of the plant. I and others have portunities of making the following remarks with regard appearances presented by the diseased plants:—They have spots upon them, called *combustion spots*—they have a dying re dried up, and withered like paper—and, in short, are a ossessing neither moisture nor strength—they are, so to void of *blood*, and dead."

nant in Nassau says—"The diseased potatoes, even when ted, shew upon their surfaces brownish-red spots, and, after kept for a little while in the cellar, they begin to get dry ongy in the interior. At a later period, I observed that s began to be formed in them, which were covered with and, finally, they began to emit a very bad smell. When the diseased potatoes was cut through, the surfaces were

noticed to have a glazed appearance; the whole crop was found to be wasting, and had a rotten smell."

A tenant in Saxony says—"The potatoes rapidly become putrefied, and, during this corruption, black spots, called *corruption spots*, make their appearance. Sometimes, externally, they have a fresh appearance, but in their interiors they are full of black spots and cavities, which last are filled with mould."

A tenant in Anholt says—"The potatoes now do not germinate, and to such an extent is this the case, that from fifty to sixty per cent. remain unfruitful; and even those which do grow have a poor and sickly appearance. The *mother potatoes* rot very soon, and afterwards the dry-rot begins to make its appearance in the potatoes which are harvested, and this it is impossible to prevent, even though every method is tried to preserve them."

A Pomeranian tenant observes—"Our potatoes are planted, to all appearance, in a state of perfect health; but, when the time for their germination arrives, they produce, in some places, small and weak plants, and in other places they fail altogether. In those places where this last circumstance occurs, the seed-potatoes have the appearance of being quite decayed. Upon making a more minute examination, it is generally found that the seed-potatoes, after being planted, have become completely changed in their appearance: they have mouldered, a kind of dry-rot has commenced, and their internal substance has altered into an elastic, spongy mass, having a light yellow colour. The potatoes which still remained in a fit state for the production of new bulbs and plants were not totally changed into this yellow spongy mass; part of them was still fresh, and upon the fresh parts being larger or smaller than the spongy parts seemed to depend the quantity of potatoes which were produced."

Professor Von Martius of Munich makes the following remarks upon this disease:—

1st, *In the beginning of the disease*, the epidermis of the potato loses its smoothness and polish, then dries up, and, finally, small spots are formed, which afterwards extend themselves. Around the spots the skin comes off in the form of scales. Underneath those places where the skin is affected the substance of the potato also becomes diseased, and its colour changes first to yellow, which afterwards becomes darker and darker, till, finally, it changes to a brown or black, and thereby causes the potatoes to have a dried up appearance. One cannot always be certain how far the disease extends through the substance of the potato. In the above condition, however, the potatoes may still be used, both for the table and for feeding cattle, as the starch in them remains unchanged.

[illegible] *When the dry-rot has commenced*, the diseased spots begin to get elevated above the surface of the potato, and form warts and small hillocks, which afterwards fall in and become cavities. From under the skin a fungus is now produced, which consists of small white spots, having their seat in the cellular fibre. The potatoes now emit a rotten smell, and the disease extends itself throughout the whole plant. The fungus decays, and the bulbs begin to get dry, and less heavy. Such potatoes cannot germinate. Frequently small rose-coloured *brood bulbs* are formed upon the sick potatoes, particularly when the dry-rot has regularly set in. When such

potatoes were cut through, they were found to be marbled internally with spots of a yellowish-brown colour, but still full of cones of decayed starch, and in some places cavities were frequently to be seen which were filled with grubs.

Kleeman characterises the dry-rot particularly well when he says—

The dry-rot does not always affect all the potatoes in the same field at the same time, and even not always to the same extent. At the beginning of the disease, the rot generally affects those places on the bulbs which are most exposed, such as the eyes, and other delicate parts. By a more minute examination may be observed either small black spots, which penetrate through the epidermis into the substance of the potato, or small black strings, which extend into the middle of the bulb, and which, in the interior, are so small, that they require the assistance of a microscope in order to become perceptible. At this period of the disease, which I shall call the *first stage*, the potatoes have no perceptible bad smell, but they have lost their agreeable flavour, and their mealiness is diminished, inasmuch as they are now very difficult to boil, and, when boiled, they do not fail to pieces. In the *second stage* of the disease, and more especially if the potatoes are kept in large heaps, the malady extends with extraordinary rapidity in the form of cancers, and the small strings above mentioned increase in size, till they become of the diameter of the tube of a tobacco pipe. These strings are particularly well observed in such potatoes as have been cut or otherwise injured in the taking up, but sometimes even on other places. The potatoes now become rotten, and of a peculiar smell; their substance is coloured, and the part infected becomes yellow. This latter circumstance is more particularly remarked when the potatoes are boiled: they contract a taste equally disagreeable with the smell, lose their mealiness more and more, and remain hard when boiled. When the disease has reached this height, the potatoes can no longer be used for the table, and can only be applied to the purpose of feeding cattle, after the diseased parts are cut away. In the *third stage* of the disease, a perfect decomposition of the constituents of the potatoes ensues, viz., of the starch, the cellular fibre, the albumen, and the extractive matter, and this decomposition ends in a complete putrefaction. Before the appearance of the third stage of the disease, the potatoes present the following characteristic marks:—Externally they have the appearance of being already far gone in decay, their outer skin crumbles and falls away with the slightest touch, and is often covered with white or blue spongy masses. Those places in the potatoes which had previously begun to moulder away, now form small cavities in the mass of the potato, and their colour externally is changed into black or green. Beneath those places from which the skin is loosened and the sponges are formed black spots are found, and the colour of the whole potato is changed to a dark brown or orange. When cut through, small black spots, called *stagnation* spots, are visible. Their smell is very disagreeable and rotten, and every symptom of speedy decay is plainly to be seen. The potatoes become watery, they no longer are softened by boiling, and are even rejected by animals: in fact they are no longer of any use whatever. The disease also appears in potatoes which are planted, insomuch that they either do not germinate, or they produce most unhealthy plants and bulbs. The former is the case when all the eyes of the potatoes are destroyed; the latter, when a few of them are left unattacked by the disease, which few only produce weakly plants.

The observations which I myself have made, not only upon the first stage of the disease, but also upon the latter ones, (and I have had great opportunities of examining this malady,) are the following:—

In the year 1841 I first observed that the potatoes had numerous brown or black spots upon them, called stagnation spots. These spots were not, as I at first supposed, caused by the places in which the potatoes were kept, but, as I afterwards had opportunities of satisfying myself, they only *extended themselves* in

these places. Upon boiling the potatoes, these spots become loosened, and may be pulled out singly. Their properties are, that they are spongy, watery, and gummy; they are more brittle and dense than the other portions of the potatoes; their taste is abominably hot and caustic; and, if chewed, cause the same noise that is made when pieces of green apples are eaten. In the dry state they are gluey. At this period the disease is more external than internal, the potatoes boil tolerably well, and, when boiled, are still mealy; if the spots are taken out, they also have a pretty good flavour. If the boiled potatoes are held before a candle, these stagnation spots are very visible. As I only use cut large potatoes for planting out, I could easily distinguish the unhealthy potatoes by cutting them, and by this means I thought I had obtained seed-potatoes free from disease.

The potatoes treated in the above manner, and being besides allowed to remain some time before they were planted, all germinated. The produce of these seed-potatoes was neither perfectly healthy nor exactly diseased, but were in a condition between both of these states. The produce in harvest was tolerably large; but the potatoes soon began to shew signs of the disease, by exhibiting a number of the before-mentioned stagnation spots, which, however, were now present in greater numbers and of a larger size than they were in the previous crop. These spots, as usual, grew larger when the potatoes were preserved in cellars, and their taste was still more nauseous than before. Many of the bulbs had few stagnation spots in their internal parts, and these potatoes still presented a natural and sound appearance. By far the greater part, however, were of that brownish-yellow colour which is a sure sign of the speedy decay of the constituents of the potatoes. Many of the bulbs had changed their naturally yellowish-white colour for an unnatural brownish-yellow tint, and contained very few mealy particles. These potatoes also, like the former crop from which they were grown, upon a very close examination, shewed, on those places where the stagnation spots lay immediately beneath the skin, *hollow discoloured places*; their smell was disagreeable and rotten, very sharp and irritating, and [illegible] were [illegible] these circumstances, perfectly uneatable; and, upon boiling [illegible] longer separated from them. All these potatoes [illegible] smooth skins as well in the first as the second [illegible] of the d[illegible] these remarks were also made by [illegible] as upon cattle potatoes.

The [illegible] the dry-rot in potatoes, such as I have [illegible] in the field after their planting as during [illegible] in cellars, are the following:—The bulbs [illegible] ner, and upon the surface, become of a lighter [illegible] appearance. Upon cutting the potato,

the mealy particles are observed to be more lustrous than is naturally the case, and as the constituents are converted into a *dead mass*, (generally of an ash-grey colour,) the substance of the bulbs becomes deprived of all moisture, giving them the appearance of having been destroyed by fire.

3°. *Signs of the Wet-Rot.*

Professor Kahlert says—"The wet-rot might also be called the fruit cancer, inasmuch as it spreads itself all around, destroying and infecting everything wherever it makes its appearance, and occasioning a putrescent decomposition and resolution of the substances contained in the bulb of the potato. The potatoes begin to be spongy and moist, and may be compressed like rotten cheese; they have a putrefying smell, and infect all the other fresh bulbs with which they happen to be in contact, and the disease in general soon spreads over the whole mass."*

Mr Freund, a tenant in Bohemia, remarks, with regard to the disease and smaller produce of the potatoes—"I have observed that, after the harvest, the potatoes perspire more than is usual, and that the moisture is not afterwards reabsorbed; and I have also noticed that they remain moist during the whole winter, and become rotten in the centre of the heap, as if the moisture had concentrated itself there."

Another tenant says the disease gives the potatoes a decaying appearance, and in that state the skin may be very easily peeled off. The potatoes, when freed from their skins in this manner, often have a green, bluish-black, or brown colour, and the bulbs may be easily compressed together like sponges.

"From the Thuringia Wald I am informed that the potatoes from fields which produced bad crops were not as heretofore destroyed by worms, but they were found to be in a wet and rotten condition."

A farmer in Immesheim writes—"The potatoes, after having lain for from eight to fourteen days in the soil, produce, on those places from which the sprouts should have proceeded, small bulbs, after which these places putrefy and die away. It is now well known, also, that when potatoes are kept in cellars for any length of time, the same appearances may be observed."

The following are the observations which I have made upon

* It is a remarkable fact that most authors in their descriptions of the potato disease, published in agricultural periodicals, in general content themselves with describing the *dry-rot*, and it is very probable that they have often confounded this with the wet-rot; at all events, it is certain that the former disease gives the potatoes a lifeless, dry, and burned appearance, while the latter has more the form of a moist and cancerous decay.

the wet-rot, more especially in connexion with the seed potatoes:—

A tenant in this neighbourhood bought two different kinds of potatoes, one a species of cattle potato, the other a table potato. Both these varieties were planted out in the year 1841, in fields having the same composition. The cattle potatoes grew regularly and well, their vegetation being most luxuriant, whilst of the table potatoes, on the contrary, only one half germinated, and those which did, produced plants of most unhealthy appearance. A portion of the produce of these sickly potato plants was planted out in the year 1842, and at the same time other healthy potatoes likewise. The table potatoes, as before, did not grow properly, but exhibited the old appearances in a more remarkable degree. I found, upon examination, that the seed potatoes were, upon both of these occasions, affected by the wet-rot, and that those which yet possessed some vitality, and which yielded some small bulbs, were only partially affected by this disease.

Upon several potato fields, and particularly on those where several species of potatoes had been planted together, and when the farmer had not paid strict attention to the quality of the bulbs which he had selected for cultivation, I found that, on all those portions of the field which were bare, the seed potatoes were affected by the dry-rot. This was the case as well with those bulbs which were cut before being planted, as with those which were planted whole. I observed a remarkable circumstance upon a field in which potatoes never had been planted before, viz., that the potatoes planted in it for the first time did not grow properly, and shewed the same appearances as upon other fields; but this was probably occasioned by the seed-potatoes being diseased previously to their being planted.

I have always found that the more peculiar characteristics of the wet-rot consisted in a more or less watery decay of the constituents of the potato, and that those bulbs which are affected by this disease may be compressed like rotten cheese. The gelatinous and putrescent mass of such diseased potatoes has a green or greenish-yellow colour, and beneath the skin (which may easily be removed) black or yellow spots are found.

[illegible] ternal diseases—*the dry and the wet* [illegible], a want of sufficient vital energy [illegible] transplanting, and also a weak power of [illegible] which occasionally goes so far as to [illegible] alteration and destruction of the [illegible]

[illegible] its signs are a perfect [illegible] the plant, and the total dis- [illegible] caused by it.

THE AGRICULTURE OF DIFFERENT AGES AND COUNTRIES.

By Cuthbert W. Johnson, Esq., F.R.S.

In a preceding page of this journal (*ante p.* 352) I have endeavoured to trace a few of the earliest agricultural improvements made by the nations of antiquity. These, we have seen, were at first exceedingly rude; for then, the population being but limited, only the richest natural soils were required to be cultivated, and nature was too bountiful in her gifts, and man, resident in an oriental atmosphere, far too indolent, to be either an active or an enterprising cultivator of the land: hence we find that, as the population of the earth increased, slaves were on most occasions made to do the work of the farm; and, moreover, all kinds of expedients were adopted to avoid manual labour—the patient bullock trod out the corn which more northerly nations, in a later age, separated with the flail. Everything else seemed in keeping with this Asiatic indolence. They rarely manured their soils—the irrigation system was a substitute for other modes of fertilizing the land—since, when once the reservoirs and channels necessary for this valuable agricultural operation were made, the water glided on to the land, without the assistance of the owner.

Irrigation, also, supplied in a great measure the incessant loss of moisture occasioned by the heat of the climate—a temperature, too, which rendered it most to the farmer's interest to cultivate only particular plants; and this effect of temperature upon his crops, as poorer soils were gradually forced into cultivation, the farmer soon perceived was very materially influenced by various circumstances occurring even in the same climate, such as by the nature of the soil, its declination, and by its elevation above the level of the sea. In tracing a few of these causes of varying modes of cultivation, I shall have occasion, in a portion of this paper, to repeat and enlarge upon what I have in another valuable periodical work, (*British Farmer's Magazine*,) some time since, had occasion to observe. The effects produced by these circumstances are chiefly to be attributed to the difference of temperature produced by change of latitude, or elevation, or declination, upon the crop which is attempted to be cultivated—an effect of whose importance indeed a very casual glance at the plants natural to the soils dispersed over the surface of the globe will serve to convince the intelligent farmer. Such a brief review was long since made, nearly in the following language, by M. Mirbel:—There are, however, many very considerable local advantages besides those I have mentioned,

such as the proximity of mountains, of forests, of the sea, &c., &c., which are all causes of variation of temperature, and must each be attended to in accounting for the natural vegetation and the *cultivated* crops of any particular district. For instance, the winter is less severe on the northern coasts of France than in the interior on the same level, an effect produced by the vicinity of the ocean; for the sea preserves a far more even temperature than the atmosphere, and is constantly at work to maintain some degree of equilibrium in the warmth of the air. In the summer it carries off a portion of the caloric from it; in the winter it gives back a part of that which it contains. It is thus that the mass of water held in the vast basin of the ocean tempers on its coasts the heat of summer and the cold of winter. For this reason, in Devonshire, and on the opposite coast of France, the myrtle, fuschia, magnolia, pomegranate, Indian rose, and a swarm of other exotic plants, grow in the open air; but in the interior of England and France require shelter. The same cause permits the cultivation of many species in the open grounds about London, that near Paris will not do without a greenhouse.

In proportion as the natural temperature of a country decreases, as we advance towards the pole for instance, we are sensible of the change in the appearance of the vegetation. The species which require a mild and temperate climate are supplanted by others which delight in cold. The forests fill with pines, fir, and birches, the natural decoration of a northern land. The birch, of all trees, is the one that bears the severity of the climate the longest; but the nearer it approaches the pole, the smaller it grows: its trunk dwindles and becomes stunted, and the branches knotty, till at last it ceases to grow at all towards the 70th degree of latitude, the point where man gives up the cultivation of corn. Further on, shrubs, bushes, and herbaceous plants only are to be met with. Wild thyme, daphnes, creeping willows, and brambles, cover the face of the rocks. It is in these cold regions that the berries of the *Rubus arcticus* acquire their delicious flavour and perfume. Shrubs disappear in their turn. They are succeeded by low herbs, furnished with leaves at the root, from the midst of which rises a short stalk surmounted by small flowers. Such are the saxifrages, the primroses, the *androsaces*, *aretias*, &c. These pretty plants take up their quarters in the clefts of rocks, while the grasses, with their numerous slender leaves, spread themselves over the soil, which they cover as with a rich verdant carpet. The lichen, which feeds the reindeer, sometimes mixes in the turf, sometimes of itself covers vast tracts of country, its white tufts standing in clumps of various forms, looking like hillocks of snow, which the

sun has not yet dissolved. If we go farther, a naked land, sterile soil, rocks, and eternal snows, are all we find. The last vestiges of vegetation are some *byssi* and some lichens which cover the rocks in motley patches.

The principal causes which induce this progression of changes are three:—1. The excess of duration in the winter, a consequence of the obliquity and disappearance of the solar rays. 2. The dryness of the air, a consequence of the decrease of heat. 3. The prolonged action of the light, which illumines the horizon through the whole period of vegetation.

It is well known that too great a degree of cold, by congealing the sap, occasions the rupture of the vascular system in plants, and thereby destroys them; but the deleterious action of cold is not confined to purely mechanical results, it has been proved that heat is a stimulus that cannot be dispensed with in vegetation. Many species secrete juices in warmer regions which are unknown in their economy in colder climates. The ash yields manna in Calabria, but loses that faculty as it approaches towards the north. The grape in the south of Europe abounds in matter of a sweet quality; in the north it contains an excess of acid. So long as the organic functions which depend upon the degree or duration of heat can be carried on, the ash and the vine continue to grow—they grow even when those functions are performed incompletely, but their growth is stinted. They finally disappear at that point where the portion of warmth in the atmosphere, though still equal to prevent the freezing of the sap, is no longer able to stimulate their organs or their frame into action.

All other vegetables, whose dimension and duration subject them to the full severity of the frost, share the same destiny, at a greater or less distance from the torrid zone, and in proportion as their constitutions require a greater or less degree of heat; so that nothing is found near the pole but such dwarf shrubs as are sheltered under the snow in winter, or annuals and herbaceous species, endowed with so quick a principle of life as to rise, flower, and fruit, within the space of three months, or some agamous and cryptogamous species, which adapt themselves to all degrees of temperature, and are consequently the last organic forms under which vegetable life is to be descried. Heat and moisture united, the farmer well knows, are highly favourable to the growth of plants. No countries are more abundant in herbaceous vegetables, or better wooded, than Senegal, Guinea, and Cayenne, where both these props to vegetation are in the plenitude of their force. Experiments made with the hygrometer prove that the moisture of the atmosphere increases as we

approach the equator.* In hot climate when the sun sinks below the horizon, the watery exhalations c[illegible] d are returned to the earth in the form of a copious dew, that moistens the surface of the foliage, and feeds those vegetables in which the absorbing power of the parts above ground suffice for their support; of this number are the succulent plants, the aloes, the *cacti*, *&c.*—in these the fibrous root only serves to hold them in their places, and the moisture of the atmosphere is inhaled and retained by the spongy parts above. Thus, in the vast plains that receive the waters from the eastern declivity of the Andes, when the scorching heat of summer has consumed the grasses and other herbaceous plants, which the rainy season has brought forth, we still find some lingering *cacti* which, under their dry thorny coats, conceal a cellular system, by which an abundant sap has been imbibed and preserved. But in countries where the atmosphere holds but little moisture in solution, either because the soil is wholly destitute of water, or by reason of the coldness of the temperature, we find no plants at all, or such only as are of a dry hard texture. The sands of Africa, unwatered by rivers, are found to be utterly barren—Spitzbergen, Nova Zembla, &c., where the influence of the sun is felt only for two months of the year at most, and where, consequently, the air is habitually dry, furnish a very scanty portion of herbaceous plants only, or some dwarf shrubs, with a narrow heathery foliage.

Vegetation, in ascending above the level of the sea, undergoes modifications analogous to those which attend its progress from the line to either pole, with this distinction, that in the last case the phenomena succeed by almost imperceptible gradations, while they crowd upon and follow each other in rapid succession on the ascent of mountains. The height of 4,000 or 5,000 yards in the hottest parts of the globe produces changes as distinct as the 2,000 leagues or more which lie between the equator and the polar regions. The three causes of these rapid changes all reappear within this space, viz., a diminution of heat, dryness of the air, and [illegible] duration of light. The higher we ascend, the shallower [illegible] upper stratum of air becomes—thence the [illegible] The weight of the atmosphere which [illegible] supports a column of mercury

* [illegible] England is about two feet. In 1840, the [illegible] at Aberdeen was 24.627 inches; at Empingham, 18.88; Epping, [illegible] Falmouth, 31.511; Gosport, 25.525; Greenwich, 18.24; York, [illegible] inches [illegible] perhaps not much below the average of the continent of [illegible] of western Europe, however, are exceedingly wet; 128 inches [illegible] at Coimbra in Portugal in a year. The fall of rain is still [illegible] Domingo 100 inches; at Cayenne, 116 inches [illegible]

equal to twenty-eight inches, diminishes as we ascend, so that, at considerable elevations, it will only support a column of a considerably less height—a power which gradually diminishes as we ascend. A consequence of this fact is, that the vaporization of fluids takes place on high mountains at a very low degree of heat. Notwithstanding this, however, the decrease of temperature is so great, that the ambient air is very slightly impregnated with moisture. It is true that heights have not the long days of the polar regions; but they receive the rays of the sun earlier than the plains, and are quitted later by them, so that their nights are shorter than on levels.

This progressive varying course of vegetation on mountains had not escaped the attention of Tournefort. At the foot of Mount Ararat he had observed the plants which grow in Armenia, a little higher, those of Italy and France, above, those of Sweden, and upon the summits, those of Lapland. Observations of the same kind have been subsequently made on Mount Caucasus, the Alps, Pyrenees, and other mountains of the old continent, and in Britain, whose hills, however, can rarely be dignified with the name of mountains. Linnæus, in his own way, had summed up these observations in an axiom. "The different kinds of plants," he said, "shew, by their stations, the perpendicular height of the earth." Yet it was not till lately that any exact survey had been taken of this interesting department of botanical geography.

The common heath, (*Erica vulgaris*,) says M. De Candolle, which covers the sandy plains that lie along the coast of western France, grows in the Pyrenees to the very summit of Mount Cenis, and to the very summit of Mount Calm, at nearly 3,000 yards of elevation. The cross-leaved heath (*Erica tretralix*) is another instance; it grows from the level of the sea to 2,400 yards of elevation. The sea-gillyflower (*Statice armeria*) is found in Holland in spots which lie below the level of the sea, and on the Alps at an elevation of 2,500 yards. *Statice plantaginea* grows on the beach of Olonne, and at 2,000 yards of elevation on Mount Viso. The coltsfoot and the birdsfoot trefoil both grow at the level of the sea all over England and France, and are met with again above Mount Jovet at the height of about 2,400 yards. The scurvy-grass, which is generally found at the skirts of the sea, flourishes also at the edge of the stream at Neuville in the Pyrenees, at the height of about 2,000 yards. Mother-of-thyme, (*Thymus serpyllum*,) which grows in every lowland spot in France, mounts also to the tops of a great many of the Alpine heights. Even thyme (*Thymus vulgaris*) ascends the Pic d'Ereslids to above 2,000 yards. Foxglove, which is met with in all the low lands of the west and midland part of

France, grows on the Lozere at 1500 yards, and nearly at the same elevation on Mount Calm.

Mat-grass (*Nardus stricta*) grows at the level of the sea, and it also forms the highest situated swards that are found in the Cevennes, the Alps, and the Pyrenees. It grows indifferently in marshy places and in those which are liable to dry up, so that it is found both on the tops of mountains where the snow disappears in the summer, and on the sides of those from whence it is never entirely absent. The sweet-scented vernal grass (*Anthoxanthum odoratum*) and the Timothy grass, (*Phleum pratense*,) which grow everywhere in England and France at the level of the sea, ascend to the elevation of 2,000 yards. The common juniper, (*J. communis*) attains an elevation of 3,000 yards. The marsh lousewort does the same; the scorpion grass 3,500 yards; and the daisy, (*Bellis perennis*,) the ox-eye daisy, (*Chrysanthemum leucanthemum*,) and the bladder campion, (*Silene inflata*,) ascend to 2,000 yards, and the kidney vetch (*Anthyllis vulgaris*) to 3,000 yards. When plants, in fact, not suited by their nature to support an excess of either heat or cold, are found to grow in different latitudes, it is always at such heights as that the effect of elevation compensates that of the latitude. Thus many of the plants of the Alps and the Pyrenees grow in the plains of the north of France, especially in the Ardennes and neighbouring provinces. Of these I have already cited some instances. Again we know that many plants which belong to Lapland, or other countries of the north of Europe, when they are met with in France, grow there at considerable elevations. *Saxifraga Greenlandica* grows in the Pyrenees very near to the summit of the Maladette, which is 3,278 yards high, and comes down to below 2,400 yards. *Linnæa borealis* is not found in the Alps below an elevation of 1800 or 2,000 yards. *Menziesia dabaecia*, which covers the low lands in Ireland, is found in Western Pyrenees as high up as 1000 yards. The chestnut grows in the low lands of the north of France, upon the hills of the south of France, and at a great elevation on the Appenines, and at a still greater on Mount Etna.

Plants which are [illegible] objects of husbandry are controlled by laws corresponding [illegible] completely with the preceding. Such as grow in all latitudes [illegible] likewise at all elevations. Those that are four[illegible] [illegible] latitudes, are found only in corres-[illegible] [illegible] learn from Humboldt, that the [illegible] the north of our old continent, [illegible] as 3,000 yards. We know that the [illegible] edge of the sea as well as on [illegible] which man can take up his abode. [illegible] ordinary elevations. Rye is

grown in France, in the departments of the Higher and Lower Alps, at 2,200 yards, particularly above Allos, in Provence. Wheat does not grow so far to the north as rye, neither will it be so well as that grown at great elevations—yet it is grown at 1,800 yards. At such elevations, sowing is generally done before harvest time, that the plants may get strength before the snow falls, which has been known to lie upon the rye the year through. When this has happened, the rye remained *in statu quo* while the snow laid, and resumed its growth at the end of eighteen months, when that had melted away. Barley will grow well only in temperate climates. It is true it may be raised under the tropics, but not at a lower elevation than from 3,000 to 4,000 feet, and then it is a profitless crop.

Cultivated plants, which do not bear cold, are under a like influence as to elevation. They can only be grown at such heights as correspond in temperature with that of the distance from the equator to which they belong. In general, it is considered that in our temperate climate a degree of latitude affects the mean temperature nearly in the proportion of 180 or 200 yards of elevation. This rule, it is true, is liable to numberless modifications from local circumstances; yet I have had the curiosity to apply it (observes M. De Candolle) to the different plants of husbandry, and have obtained some results that may be worth recording. The most elevated point at which I found maize was grown as a crop is in the department of the Lower Pyrenees, above the village of Lescans, at about the elevation of 1000 yards. Now, if we take our departure from that point, which is the 43d degree of latitude, and proceed five degrees upon the same meridian line, we come to the neighbourhood of Mans, and to the south of the departments of Ille and Vilaine, which are precisely the northernmost points where maize is used for a crop.

The vines of Velai are perhaps the highest vineyards. The elevation of the town of Puy is computed at 632 yards, and the vineyards that belong to it go up to about 800. Now, if setting out from that point, which is a little beyond 45 degrees of latitude, you take four degrees to the north upon the same meridian, you come to between Rheims and Epernai—that is to say, very close upon the northernmost limit at which the vine forms a branch of husbandry. With regard to the olive tree, the local peculiarities of the countries where it grows are such as to make investigations of this kind very intricate. It is generally cultivated in parts protected on the north by some vast range of mountains, where the mean temperature is consequently higher than it would otherwise be. When it is not sheltered by any range of mountains, the northernmost point in Europe at which we find the olive is Ancona, in 43° 37′ of latitude. In respect to

the other point of view, its positions have b[illegible] measured in several parts of Roussillon, Languedoc, Pro[illegible]nd Italy, and these have been always nearly at an elevation of 400 yards above the level of the sea, which ought to indicate that the olive might grow two degrees more to the north of Ancona. Now, if we take two degrees towards the north from that point on the same meridian, we come to about Lake d'Itarde, and the neighbourhood of Como, which are just the northernmost points at which the olive is cultivated. The fig-tree, which goes farther to the north than the olive, and not so far as the vine, preserves a corresponding gradation in regard to the elevations at which it will grow; but we can hardly determine any precise limit for a tree over which aspect has more power than the degree of positive heat. The same may be observed in regard to the walnut tree, which reaches a little higher both in latitude and elevation above the sea than the vine.

The common oak (*Quercus robur*) grows in the plains on a level with the sea, reaches the slopes of the mountains, and ascends to the height of 1600 yards. It degenerates in proportion as it approaches the point where it ceases to vegetate. The beech (*Fagus sylvatica*) makes its first appearance at the height of 600 yards above the sea, and its last at 200 yards above the oak. The silver fir (*Pinus picea*) and the yew (*Taxus communis*) shew themselves at 1400 yards, and extend to about 2,000. The Scots fir (*Pinus silvestris*) and the *Pinus pumilio* take their stations between 2,000 and 2,400 yards. There the trees stop, and shrubs with a juiceless foliage, and low or creeping stems, present themselves: these lie hid beneath the snow in winter. Amongst them are some of the *Rhododendrums*, *Daphne*, *Salix*, herbacea, and *Reticulata*, &c. Soon after we meet only small herbs with perennial roots—a foliage disposed in a rosette and a naked stalk. These, with the lichens and *Byssi*, arrive at the height of 3,000 and even 3,400 yards. The first that occur are the *Gentiana campestris*, *Saxifraga*, &c.; then *Ranunculus alpestris*, *Aretia alpina*, &c.; and, finally, *Ranunculus glacialis*, *Saxifraga cespitosa*, *oppositifolia*, *Androsacea*, and *Groenlandica*. The last brings us to the borders of eternal snow. These are European observations; but Humboldt and Bomplaud have demonstrated a similar succession of plants in the New World, and in one of the hottest and most fertile regions of our globe.

In the equinoctial countries of America, vegetation displays itself to the view of the observer as on the gradually rising steps of an immense amphitheatre, the base of which sinks below the waters of the ocean, whilst its summit reaches to the foot of the glaciers which crown the Andes, 5,000 yards above the level of the sea—shewing that in America there are vegetables which

grow at the height of 1600 or 1800 yards beyond the point where vegetation ceases in the Pyrenees and Alps, a difference that does not depend solely upon latitude, but also, according to Mr Ramond, upon the breadth of the chain of mountains. In chains but of little breadth, such as those of Europe, the air and temperature of the plains have an influence which is constantly tending to confound the limits of the different kinds of vegetables; but this is not the case in the chain of the Andes, which is from forty-eight to sixty leagues in breadth. (*Journ. Science*, vol. iv., p. 176.—*Brit. Farm. Mag.*) The plants which belong to dark and humid abodes, such as *Boletus ceratophorus*, *Byssus speciosa*, &c., are found on the vaults of caverns and the wood-work of mines, as well in Mexico as in Germany, England, and Italy, concealed within the bowels of the earth; these less perfect species constitute the last zone of vegetation. Next come the plants which belong to fresh water and to salt water; of these a great portion grow, without preference, in every degree of latitude, the medium in which they exist preserving a more equable temperature than the atmosphere. Dock-weed (*Lemna minor*) and the greater reed-mace, or cat's-tail, (*Typha eatifolia*,) grow in the marshes both of Asia, Europe, and America—the latter being common to Jamaica, China, and Bengal. Probably there is no region on the globe where the grey bog-moss (*Sphagnum palustre*) is not to be found. This indifference to climate is still more remarkable in the sea-plants, such as the *Fuci lavers* and *Ceramia*; the gulf-weed (*Fucus natans*) detaching itself from the rocks on which it grew, and forming shoals of an immense extent on the surface of the water, obstructs the ship's way as well towards the poles as under the line. On a level with the sea, and to a height of 1000 yards, we find the palms, the liliaceous plants, the plantain trees, and the balsam of solu, with crowds of other species which grow only in a very hot temperature. This is the zone of the palms—a tribe conspicuous for the elegance and grandeur of part of its species, and forming one of the chief ornaments of the scorching plains that lie between the tropics; some of them, however, thrive in more temperate regions. The *Ceroxylon andicola*, a fine palm rising sixty yards in height, grows in the Andes, at Tolima and Quindiu, in the 4° 25′ of northern latitude, setting off at 1860 yards above the sea, and continuing to the height of 2,870, an elevation where the atmosphere is at a moderate degree of warmth. Another species has been discovered at the Straits of Magellan towards the 53d degree of southern latitude. Two sorts—the fan-palm and date-tree—are even seen to grow on the southern shores of Europe, upon the coasts of the Mediterranean, and not far from the foot of the Pyrenees, thus advancing their tribe to beneath the 43d

degree of northern latitude; but these are exceptions, the palms in general confining themselves to the hottest parts of the globe, and none being met with towards the polar regions.

Some of the effects produced on different soils and in various climates by a difference in the annual amount of rain, have been sketched by Mr John Morton, in his excellent work on soils, a volume which I have often had occasion to recommend to the careful perusal of the farmers of our islands. When treating of the effects of varying degrees of moisture on vegetation, he alludes (p. 214) to a calculation of M. Humboldt, who states the proportional quantity of rain in different latitudes to be—

Latitude.	Mean annual depth of rain.
0	96 in.
19	80
45	29
60	17

But local causes, as continues Mr Morton, have the effect of greatly altering their quality. Thus, much more rain falls on mountains, and in their immediate neighbourhood, than on low level land; and, again, the proportion is larger on the sea coast than on inland plains; so that it may be taken as a pretty general axiom by the farmer, that the humidity of the atmosphere decreases according to its distance from the sea. At Keswick and Kendal in Cumberland, the annual quantity of rain is about sixty to sixty-seven inches per annum, while at places in the interior the average is only about twenty-four inches, and on the borders of Essex and Hertfordshire only about nineteen inches. The greatest proportion of rain in England generally falls in September, October, and November. But even climate is very materially altered by the improvements effected by the skilful agriculturist, such as by the drainage of lakes, bogs, and morasses, the clearing away of forests, the more perfect drainage of cultivated soils, and the conversion of pasture into arable land. In those localities where such improvements have been extensively effected, the evaporation from the surface of the earth is very considerably diminished, and, in consequence, the surrounding atmosphere [illegible] and warmer. This has been partially exemplified [illegible] Scotland, and in the fens of Lincolnshire, [illegible] drained.

[illegible] the mean average depth of rain which [illegible] nature of the soil, and especially of the subsoil [illegible] retards the arrival at maturity of its crops—for instance, the [illegible] is much earlier on siliceous, sandy, or gravelly soil, and considerably later on aluminous or clay soils than we might be reasonably led to expect from the

mate, and their elevation above the level of the sea—thus the ops are never so good or so early on cold tenacious clay soils the gritstone formation, or on the moorlands in Yorkshire, an elevation of 500 feet, as they are on the chalk wolds in the ne county, at an elevation of 800 feet. It is this difference ich gives to dry calcareous and siliceous soils so very consider-le an advantage. Land situated at still greater elevations an this, is in this country of still less value, and at an eleva-n of 1000 feet above the level of the ocean it ceases to be ofitable for arable purposes, since it is only in very particular asons that the crops ripen, and hence at such an altitude the ıd is generally devoted to pasturage.

The effects, then, which I have thus rapidly traced of varying isture and of heat upon the indigenous plants of the earth, d upon the cultivated crops of agriculture, are circumstances ich must be carefully regarded by the farmer who is desirous varying the ordinary modes of cultivation. They are facts, wever, like all those where the influence of the seasons concerned, which must be ever subjected to very material iations; but still they are sufficiently uniform in their general ults to enable the cultivator to draw highly important conclu-ns, which will not only tend to improve his knowledge of the st scientific modes of productive farming, but enable him to ıtinue his healthful and gratifying researches with all that ɔle confidence which a better understanding of the works of d, as so beautifully displayed in the laws which regulate the getable world, is certain to increase.

RESEARCHES ON THE FATTENING OF CATTLE AND THE FORMATION OF MILK.

By MM. Dumas, Boussingault, and Payen.*

All animals and all plants contain fatty matter, (la matiere sse.) The first thought of all observers on seeing it accumu-e in certain tissues, modify itself, and at times disappear ɔgether, must have inclined to the generally-admitted opinion t fatty matter is produced through the medium of the nents of the plant or animal, and by processes analogous in th.

* Translated from Les Comptes Rendus of 13th February 1843.

The researches of which we are about to give a short account, tend, on the contrary, to prove that fatty matter is formed in plants only, that it passes already prepared into animals, and that there it may be either consumed at once for the development of the heat which the animal requires, or take its place more or less modified in the tissues, to serve as a reserve for respiration.

This last opinion is certainly the most simple that can be taken of these phenomena; but, before discussing the experiments which confirm it, it will be necessary to shew how all the ideas which have been hitherto formed on the origin of fatty matter have been successively overturned. It were useless to search into the views which the ancient chemists may have held on this subject. It is since the origin of modern chemistry alone that philosophers have been conducted by a more intimate knowledge of the elementary composition of organic substances, and by the observation of some accidental phenomena, to construct true theories on the formation of fatty substances.

It was thus that, at the period of the emptying of the "Cemetiere des Innocents," the transformation of the muscles or internal organs into real fatty matter was unhesitatingly admitted to be an effect of the putrid decomposition of animal remains. "The fat of dead bodies," as they called that product into which the muscles, the liver, the brain, &c., of the disinterred bodies appeared to be transformed, was considered as the direct effect of the alterations which the flesh, and, in general, the fibrous parts of the tissues, had undergone in the lapse of years in the grave. This opinion, somewhat later, was strongly supported by the experiments of M. Berzelius, who, having submitted fibrine to the action of powerful acids, such as the nitric, imagined he had discovered that fibrine, in dissolving, lost azote, and developed fatty matter; in fact, if the azote is withdrawn from fibrine, the remaining elements approach the composition of fatty matters. But, on the one hand, the researches of M. Chevreul, on the fat of dead bodies, have perfectly established its nature, proving that this substance contains the same acids in which they exist converted into soap by ammonia.

M. Gay Lusac, on the other hand, has shewn, by direct experiments that fibrine, submitted to putrid decomposition, leaves, as a residuum, a quantity of fat not sensibly greater than that which solvents can extract from it in its natural state. Whence [illegible] that the result of putrefaction is to destroy the fibrine, and consequently, expose the fat substance which it contains.

[illegible] another process, some chemists supposed they had discovered the formation of a fatty matter in the action of nitric acid [illegible] during the preparation of oxalic acid. There is, in fact,

fatty substance, but M. Chevreul has long ago proved that this matter pre-existed, and that the reaction which destroys the starch merely sets it free.

We may therefore affirm that all the opinions rashly put forth on these pretended formations by chemical processes have one by one vanished as they were subjected to a strict examination.

Let us now inquire into the results obtained by physiology. Carnivorous animals contain fatty matters, and they do not give them out by any of their excretions. It is consequently in these animals that it is easy to discover whence these substances are derived and how they disappear. When we examine the progress of digestion in dogs, we are soon convinced that their chyle is far from being at all times of the same nature; that which is formed under a vegetable diet, rich in fecula or sugar, or that which comes from the digestion of lean meat, are equally poor in globules; these chyles are transparent, very watery, and yield but little to ether.

On the contrary, if these animals are fed on fat meat, their chyle is very thick, of a creamy appearance, very rich in globules, and yields to ether much fatty matter.

These facts observed by M. Magendie, and again with still more detail by MM. Sandres and Bouchardet, shew, by the clearest evidence, that the fat substances of our food, divided or converted into emulsion by digestion, pass, without much alteration, into the chyle, and thence into the blood. M. Donne has seen milk, injected into the veins, remain several days in the blood. The buttery globules, in fact, continue perfectly visible in the blood during a certain time: it is not possible to be mistaken in this. The fatty matter of our food may thus be followed into the chyle, and thence into the blood, where they continue long unaltered, waiting to be taken up by the organs.

Every chemist will be led to conclude, from these observations, and the many facts connected with them, that the fatty matter, ready prepared, is the principal if not the only product by means of which animals can renew the adispose substance of their organs, or furnish the butter in their milk. Such, also, is the opinion which MM. Dumas and Boussingault put forth on this subject in 1841.

This opinion will give rise to no sort of doubt so long as it is confined to carnivorous animals; but if we would extend it to the herbivorous two difficulties present themselves:—1*st*, Is there found in plants sufficient fatty matters to explain in this way the fattening of cattle and the formation of milk? 2*d*, Is it not more simple to suppose that the butter or the fat are the products of some transformations of sugar, easily imagined when we consider

its constitution and that of the fatty matters? It seems so unnatural to allow that the fattening ox finds the fat which he assimilates in his food, that one cannot admit the idea without having made many analysis of plants, and seen the fatty matters reappear everywhere, and in quantity almost always greater than is thought to exist in the vegetable organization.

But it is no longer startling when one is convinced, as I have been, by the researches to which I have dedicated the last ten years, that there is almost constantly found in plants a union of neutral azotized matters and fat substances. I have seen this conjunction, not only in the seeds, but also in the leaves and stalks. It is thus that we have been led—M. Dumas by views of animal physiology, M. Boussingault by agricultural studies, and myself by my opinions on the physiology of plants, and by my experiments on the composition of their tissues—to adopt the same opinion, and to submit it to the proof of experiment. According to this opinion, the fatty matters are principally formed in the leaves of plants, and they often assume in them the form and the substance of waxy matter. In passing into the bodies of herbivorous animals, these matters are subjected in their blood to the influence of oxygen, and undergo a partial oxydation, from whence results the stearic or oleic acid which is found in tallow. In undergoing a second elaboration in the carnivorous animals, these same substances, oxydized anew, produce the margaric acid which characterises their fat. Lastly, these different principles, by a still higher oxydation, produce the volatile fat acids that appear in the blood and sweat. Fully admitting that, when completely acted upon by oxygen, they may be changed into carbonic acid and water, and disappear from the animal economy. Thus, taking our starting point from the wax of the leaves, we shall see it pass by digestion into the chyle of the herbivorous animals, undergo in their blood an oxydation which forms it into stearine and oleine, and from thence passing into the carnivorous animals, the stearine, oxydized anew, becomes margarine; at last, by a fresh oxydation, are formed the volatile acids, such as the caproic, capric, hersic, and butyric. Although this system is quite ...mple, one cannot help comparing it with an opinion which rests ...turally on the researches undertaken by M. Dumas, and of ...ich he has already given a summary to the Academy. In fact, we may consider sugar as formed of carbonic gas, water, and olefiant gas. Now, why should not the olefiant gas, once separated, ...ke different states of condensation, and combine with water, so ... produce common alcohol, oil of potatoes, ahalic alcohol, ...ganic alcohol, &c. These different bodies, in oxydizing, pro... the fatty acids, and afterwards fat itself. Since it is known ... [illegible] ... the same which is found in brandy

ɔm the refuse of grapes, (*marc de raisin*,) from corn, and ɔt-root molasses, the certainty that this oil is a product of ɛntation of sugar seems complete.*

therefore, possible that, in the act of digestion, the ving rise to a like oil, or to one more condensed, may ɜ in the fat of herbivorous animals—chemically speaking, nothing is opposed to it. It is, therefore, not possible n the accumulation of fat in carnivorous animals other- a by supposing that it comes to them from the herbivo- s; but, in the case of these last, admitting that they the fat which plants contain, we may suppose that they a certain quantity more by means of a special fermenta- ıe sugar which forms part of their food. This supposi- mes still more natural when we see the saccharine juices : sugar at the moment of the flower and the fruit being ıs if the sugar of the juices went to form the oils or the h are found in the fruits or the seeds. If, in spite of sumptions in favour of the intervention of sugar in the ı of fat in animals, we have adopted a contrary opinion, the facts have appeared to us completely in accordance ɜ opinion, and completely opposed to the hypothesis cribes to sugar an essential part in the production of ɔvertheless this hypothesis, which we combat, rests on lts worthy of our utmost attention, on account of the ıtation of the observers who have recorded them, and quences which follow them. The first was obtained by ınd, as may be easily imagined, relates to bees; the riginates from M. Liebig, and, as is known, relates to ıing of geese. Huber found, in fact, that bees, fed on r even on sugar, possess the power of producing wax length of time. He estimates even the quantity of wax ȝar can produce.

ysiologists and all chemists have copied the results of ɜxperiments without examination, and have agreed with wax is formed in bees by an act of their digestion with of food whatever—with sugar for instance. As for us, d to believe that it is with a bee as with a nurse. If a ls in her food the fatty matter and the proteine requi- ıer milk, she produces milk for her nursling, and her ɔes not suffer. If, on the contrary, she is deprived, in in part, of albuminous or fat aliments, she still yields she becomes thin, and in this case the milk is produced

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* e speak of the oil of alcoholic composition, while another substance of f essential oils appears to be the origin of the characteristic odour of the atoes.

at the cost of her own substance. When we shall not rest satisfied with merely examining if bees fed on honey can make combs, but proceed to inquire how much they lose of weight and of fat under the influence of such a regimen, we shall arrive probably at a perfectly opposite conclusion from that of Huber. Bees continue to produce wax, more or less mixed with their own fat, for some time after they have been placed on a purely sugar regimen; their wax becomes then gradually more and more fusible or soft, on account of the mixture of stearine or oleine, as Huber himself has stated; but, without doubt, under these circumstances their bulk diminishes in a perceptible degree. This is a subject which at present occupies one of our brethren, M. Edwards, and, although serious difficulties have presented themselves, we feel assured that to him they will not prove insurmountable. Independently of Huber, whose name is held in such veneration in the scientific world, M. Liebig has recently published opinions and experiments relative to the origin of the fatty matter of animals. M. Liebig, along with Huber, assigns the fat of animals to the sugar or the starch of their food. He seeks to strengthen this opinion by chemical formulæ tending to prove that the sugar or the starch are changed into fat by losing oxygen. M. Liebig expresses himself on this point in the following manner in one of his recent works:—

> The relations between the sorts of food and the end which they serve in the animal economy are now much clearer to us since organic chemistry has taught us to examine them by the quantitive method. A lean goose, weighing 2 kilogrammes, increases 2 kilo. 50 in the course of thirty-six days, during which time it has consumed in fattening 12 kilos. of maize. At the end of this time 1 kilo. 75 of fat may be extracted from it. It is evident that the fat has not been found ready formed in the food, for it hardly contains $\frac{1}{1000}$th part of fat or similar substances.

We are convinced that this experiment on the fattening of the goose is perfectly exact; for its details correspond with what we ourselves know on this point, according to what takes place at Strasburg, Dijon, &c. But we cannot imagine that M. Liebig can be ignorant that maize contains something else besides fecula, when the mere pounding of maize with water produces a true emulsion, and when the analysis of maize, already published by one of ourselves, has given the following results:—

Starch, ...	71.0	
Azotized substances, .	12.0	in three distinct states.
Fatty matters, . .	8.7	one solid, the other liquid.
Cellulose, . . .	5.8	
Dextrine and Sugar, .	0.5	
Colouring matter, .	0.05	soluble in oil, ether, and, above all, alcohol.
Salts	2.0	
	[illegible]	

Fresh experiments, in confirming all these facts, have shewn us that the fatty matter of maize is always present in the proportion of 7.5 to 9 per cent. It is not surprising that we, who were aware that maize is very rich in fixed oil, have come to the conclusion, from its frequent and profitable employment in the fattening of animals, that it is by its fat substance that this grain fattens; while M. Liebig, persuaded that maize contains no oily matters, naturally draws from its use the contrary conclusion, and sees in the fecula of the maize the origin of the fat of those animals that are fed on it.

We are quite satisfied that those who will take the trouble (as we have done) to repeat the analysis of maize will find, like us, nearly 9 per cent. of oil. This quantity will appear less extraordinary when we add that the cotyledon of the cereal plants is always very rich in oil, and that that of maize in particular contains two-thirds of its weight of it, and that this cotyledon is much more bulky in proportion to the fruit in maize than in the other cereals. Thence nothing is more easy to explain than the fattening of animals on this food. It is very evident that the fattening power of maize, so universally applied, should in nowise surprise us, and that the most simple mode of explaining it is to admit that the fatty matter passes ready formed into the animals which are nourished by it, and is there fixed more or less modified. But in this view of the subject we must account also for the fattening properties of certain substances evidently less rich in the fatty principle. Thus, for instance, it is very easy to shew that a cow in good condition, eating 100 kils. of dry hay, produces 42 litres of milk, containing 1 kil. 5 of butter. If our opinions are well founded, we ought to find in the dry hay 1.5 per cent. of fatty matter capable of producing this butter. Now the analysis of various samples of hay have given us 1.875 to 2.00 per cent. M. Boussingault at the same time, without having any knowledge of our experiments, was led by the same views to make the same trials. Meadow hay and second crop of good quality yielded to him nearly 2 per cent. of fatty matter, and in samples of red clover, cut in flower, the proportion rose to from 3 to 4 per cent. We may therefore affirm, on the universal experience of agriculturists, that the hay consumed by a milk cow contains a little more of the fatty matter than the milk which she produces. Nothing warrants us to imagine that this animal is capable of forming the fatty matter of her milk, and everything leads us to believe that she receives it ready made in her food. We may fear some error in thus comparing hay taken by chance, and the yield of milk equally taken by chance, although they both were averages. A direct experiment would, doubtless, be better, shewing the proportion of butter

by analysis relatively to the fatty matter of the hay eaten by the cow, and itself analyzed with care. This experiment has been made, and made by M. Boussingault, with such care, and on such a scale, as, we are persuaded, will convince agriculturists. The experiment was carried on for a year with seven cows of the Swiss breed—the milk was measured with care at the two milkings of each day. The seven cows produced 17,576 litres of milk of a mean density of 1.035. According to this, we may estimate the weight of the milk at 18,195 kils. Analyses often repeated, and with trifling variations in the results, shew in the milk 0.7 per cent. of butter completely deprived of water, from whence it follows that the seven cows have given, during the year, 673 kils. of butter; during this time they have eaten each 15 kils. of hay, aftermath, and clover per day—that is to say, the seven cows have ate in all, during the year, 38,325 kils. If we grant that the hay contains merely 1.8 of fatty matter per cent. we find that the 38,325 kils. represent 689. If we assume that the mean proportion amounts to 2 per cent., we find in all 766 kils. Taking into account the clover used, which is still more rich, we see that even this last quantity will be much exceeded. Now the butter obtained only reached to 673 kils. Thus, to produce a quantity of butter amounting to 67 kils., a cow eats a quantity of hay which contains of fatty matter at least 69 kils., but probably 76 kils. or even more. The conclusion which it seems to us the most natural to draw from this experiment is, that the cow extracts from her food almost all the fatty matter which it contains, and that she converts that fatty matter into butter.

Perhaps one could, at will, but always within certain limits, cause the proportion of butter in the milk, and also its quality, to vary. To prove this, for instance, is it not enough to recall to mind that the butter of cows in the same locality varies very much according as they are fed on green forage or on dry food; that the butter of the Vosges, for instance, contains in summer 66 of margarine to 100 of oliene, and in winter as much as 186 of margarine to 100 of oleine? In the first instance, the cows pasture on the mountain; in the second, they eat dry forage in the cow-house. But, doubtless, it would be more satisfactory to give here a direct experiment on this point, which appears to us conclusive. If we exchange half the ration of hay given to a cow for an equivalent quantity of rape-cake, which is still rich in oil, the cow will continue in good condition, but the milk yields a less solid butter, which has to an intolerable degree the peculiar savour of rape oil. What can be objected to this experiment, conducted by one of ourselves, and how avoid acknowledging that the fatty matter in the food passes into the milk scarcely at all altered, to form butter?

Let any intelligent agriculturist, guided by suitable chemical study, make use of these ideas, and he will soon succeed, we doubt not, in modifying the quantity as well as the flavour of the products of the dairy, at will, by judiciously varying the nature of the food given to his animals. We do not hesitate to affirm that what we have said above of the experiment conducted by one of ourselves on seven cows is applicable to the generality of cases. It results, in truth, from all the details, that 100 kilogs. of hay, clover, or aftermath dry, and still more an equal quantity of green food eaten by cows, yields, on an average, 42 litres of milk. In like manner we find, on an average, that 28 litres of milk contain and yield 1 kilog. of butter: hence it follows that 100 kilog. of dry hay yields 1 kilog. 50 of butter. Now the analysis shews in dry hay a quantity of fatty matter which rises at the lowest to 1 kilog. 875, or 2 per cent.; consequently a larger quantity than the milk produced contains, and which represents at the same time that which is found in the excrements of the animal. M. Riedesel, an agriculturist who has attentively studied this subject, presents the results under another form. He separates the food of the cow into two parts, and distinguishes the allowance for support from that which goes to the formation of milk. According to him, a cow weighing 600 kilogs. requires 10 kilogs. of dried hay for her ration of support. On this allowance she could not produce milk without becoming lean; but for each kilog. of hay which she eats, above the 10 kilog. of support, she yields one litre of milk, so that such a cow, eating 20 kilog. of hay, can yield 10 litres of milk. These results correspond to our own researches, but they require a different interpretation. According to our opinion, it would be wrong to admit that a cow can extract 10 litres of milk from 10 kilog. of dry hay. This appears to us impossible; because 10 litres of milk contains 0 kilog. 370 of butter; and 10 kilog. of dry hay only contain 0 kilog. 187 of fatty matter. May it not be thus. When a cow eats only 10 kilog. of dry hay, she consumes all the product she can extract from it, whether they be azotized, fat, or saccharine matter; but if the cow gets 20 kilog. of dry hay, she finds in it saccharine or analogous products in quantities more than sufficient for her daily support, and nothing prevents her from reserving, under the form of milk, a portion of the azotized matters, and almost the whole of the fatty matter. We know, besides, that as the cow fattens, her allowance remaining the same, the milk diminishes in proportion to the increase of the weight of the animal, and in a relation which we shall presently point out. Like all other animals, the cow requires to produce each day a given quantity of heat, which she developes by means of the soluble products contained in her

blood, before having recourse to the insoluble products, such as the neutral fat substances which the chyle is constantly pouring into it. Thus, at the short allowance of 10 kilog., a cow consumes all that she absorbs; if she eats 20 kilog., she makes a selection, consuming certain products and reserving others, and thus she finds the 0 kilog. 370 of butter, which her milk contains, in the hay that she had, and where analysis, in fact, shews us, at the lowest, 0 kilog. 370, and even 0 kilog. 400 of fatty matter. But if it is true that the hay contains enough of the fatty matter to represent the butter which exists in the milk yielded by the animal fed on it, shall we find the same result when the cow is fed on aliments of a different kind—the answer will be easy. Thanks to the details which we owe to the politeness of M. Damoiseau, one of the most attentive observers who has studied the subject of the production of milk, and who has carried the rigour of scientific methods into the study of all the phenomena which he had under his eyes in his fine establishment.

Comparative Rations for a Cow.

	Kilogs.		Kilogs.		Kilogs.
Mangel-würzel, . .	40	Carrots,	34	Potatoes,	25
White Bran, ...	3	—	3	—	3
Coarse Flour, . . .	2.5	—	2.5	—	2.5
Lucerne, ...	3	—	3	—	3
Oat Straw, ...	6	—	6	—	6
Sea Salt, ...	0.05	—	0.05	—	0.05
Product in milk and cream,	Max. 54.55		Mean, 48.55		Min. 39.55

In order to comprehend the true meaning of these expressions we must add that the minimum of milk was 7 litres per day, the mean rose to 9 or 10 litres, and the maximum rose to 15 litres per day.*

Comparative Rations for a Milch Ass. | *Rations for a Goat.*

	Kilogs.		Kilogs.		Kilogs.		Kilogs.
Mangel-würzel,	14.000	Carrots,	11.900	Potatoes,	8.744	Mangel-würzel,	[illegible]
White Bran, .	0.950	—	1.050	—	1.050	— —	[illegible]
Coarse Four, . .	0.955	—	0.955	—	0.955	— —	[illegible]
Lucerne, . . .	1.050	—	1.050	—	1.050	— —	[illegible]
Oat Straw, . .	2.100	—	2.100	—	2.100	— —	[illegible]
Sea Salt, . . .	0.020	—	0.020	—	0.020	— —	[illegible]
Pro. in milk and cream,	Max. 19.175		Mean, 16.075		Min. 13.919		Max. 8.370

Taking the solid equivalents of potatoes, carrots, and mangel-würzel, we still see, according to the experiments tried on milk

* The cow-keepers who provide Paris, and large towns in general, get quit of those cows which, from getting fat, or from other causes, give little milk; hence it [illegible] that the average yield of milk is higher in such localities.

uses, that the potatoes give the maximum of milk just as we had found in the milch cow.

Let us now calculate the real value of these different sorts of food, and let us take first, as an instance, the allowance of which mangel forms the principal part. It is made up of 40 kils. of mangel, 14 kils. 55 of bran, lucerne, and straw, which appears only destined to distend the stomach of the animal, as has been generally supposed. Chemical analysis will teach us what we ought to think of this opinion. The oat straw does not contain less than 5 per cent. of resinous fatty matter, (*matière grasse resinoide*,) the lucerne 3.5 per cent., the bran 5 per cent.: hence it follows that, in the food of a milk cow in the establishment of M. Damoiseau, there is

5 kilogs.	5 Bran and coarse flour,	at 5 per cent.	=	0 kilog. 275 of fatty matter.
3 —	0 Lucerne,	at 3 per cent.	=	0 — 090
6 —	0 Oat straw,	at 4 per cent.	=	0 — 240
				0 — 605

Here we have 600 grammes of fatty matter, a quantity more than sufficient to produce not only 10 litres of milk, but even 15 litres of milk very rich in cream—quantities containing 400 to 550 grammes of butter. If, besides this, the cow gets 40 kils. of mangel, she finds in this additional food 6 kils. of solid matter, formed of sugar, which she absorbs, 20 grammes of fatty matter which can be formed into butter, and azotized matters which may be converted into caseine. The water of the mangel, moreover, is far from being useless—it is equally necessary for the production of milk as for the various vital functions of the animal. When the cow gets 25 kils. of potatoes, it is still 6 kils. of dry matter that she is receiving; this matter contains equally 20 grammes of fat substances, combined with a great quantity of starch, which may be changed into sugar and albuminous matters which take part in digestion. If the potato yields less milk than the mangel, it is, doubtless, because it contains less water. According to the analysis, it requires nearly 33 kils. of carrots to represent 40 kils. of mangel; but the regimen of carrots is had recourse to for other reasons than those which relate to the economical production of milk.* It results from this examination that, if, instead of the 20 kils. of dry hay, a cow gets 14 kils. of oat straw, bran, or lucerne, and 6 kilogs. supposed dry, of mangel or potatoes, in all

* This sort of food is reserved for those cows which are not so good milkers, and whose milk it is wished still farther to impoverish, in order that it may serve as a substitute for woman's milk. This is done with a view to avoid a too sudden transition when the milk of a nurse chances to fail.

20 kilogs., in this last regimen the mangel or potatoes constitute the ration of support, and sustain the life of the animal by their sugar or their starch. On the other hand, it is the oat straw, the bran, and the lucerne which furnish the greater part of the fatty matter necessary to the production of milk. If we now pass to the phenomena of the fattening of animals, we shall find so exact an application of the principles we have laid down, that if any circumstances remain to be explained, we hope they will soon be so, by those agriculturists who will hasten to engage in the experiments necessary to verify the views which have so much interest for them.

Setting out from the figures resulting from the experiments of M. Riedesel, which correspond in some points with the information which we have ourselves obtained, we arrive at the following results:—According to M. Riedesel, an ox weighing 600 kilogs. keeps up his weight when he eats 10 kilogs. per day of hay; in fattening, the same ox requires 20 kilogs. per day; and on this allowance he can gain 1 kilog. in weight. While we consider the experiments of M. Riedesel as presenting too favourable results, by giving the maximum of the nutritive power of hay or its equivalents, we admit with this agriculturist that 10 kilogs. of hay may produce about 10 litres of milk, or nearly 1 kilog. of beef: it remains to be seen what a kilog. of increase in the weight of an ox consists of. Now we may conceive that this kilog. is divided thus: Admitting that the fatty matter of the hay is taken up by the animal, in the same way as it passes into the milk of the cow, we find that the ox has gained about 0 kilog. 370 of fat; there remains then 0 kilog. 630 of moist flesh, which ought to contain 0 kilog. 160 of dry flesh. Whence it follows that an ox which is fattening, granting that he takes up into his tissues all the fat substance of the hay which he eats, does not however derive from his food more than the half of the azotized matter which the cow extracts from it under the form of milk, and that he loses the whole of the aliment which the cow converts into the sugar of milk. It is not necessary to revert to this examination to shew how great is the difference between the cow and the ox, with regard to the profit which they extract for the benefit of man from the food given to them. In truth, in this example, which we borrow from M. Riedesel, the cow which has consumed 10 kilogs. of hay above her ration of support, yields 10 litres of milk, which represent 1 kilog. 4 of solid matter, while the ox has only increased 1 kilog. with the same food, and of this kilog. the water absorbed into the tissues of the animal ought certainly to be counted as the half. Hence it follows that there is exaggeration in supposing that the ox has absorbed 0 kilog. 500 of solid matter

with the same food which furnished 1 kilog. 400 of it to the milk of the cow. A milch cow, then, draws to the profit of man, from the same pasture, a quantity of matter for the food of man which may be more than double that extracted from it by a fattening ox. We see, then, that whatever tends to establish the trade in milk upon a basis which may inspire confidence and deserve it, would be worthy of the highest attention from an intelligent administration. Hence it follows also that a more general introduction of Swiss fruit-shops and cheese manufactories would be of most essential service to the agriculture of France, at least in those localities where it is not possible for man to consume the whole dairy produce in the form of milk.

Let us now see if these views correspond with general experience, and examine if the relations which we have stated between the secretion of milk and the fattening of cattle are confirmed by practice.

The following note, which we owe to the politeness of M. Yvart, gives a summary of a long series of facts. "The secretion of milk," says this talented veterinarian, "seems to alternate with that of fat. When a milch cow grows fat her milk diminishes—the best milkers remain long thin after calving. In some of the English breeds, where the fatty cellular tissue is much developed, as, for instance, the Durham breed, the quantity of milk may be very great after calving; but they quickly grow fat, and the secretion of milk does not last as in the Dutch and Flemish cows. English swine, which are much more inclined to fatten than the swine of the French breed, are rarely such good nurses, that is to say, they give less milk." If we admit that there exists such a balance between the formation of milk and that of fat, we are very near admitting, also, that the fat food indispensable to the production of milk is not less so to the production of fat in animals.

Are there any circumstances in which animals have been fattened with food devoid of fat? We confess we have not met with a single fact which has appeared to us to lead to such a conclusion. A very clever agriculturist has tried, for instance, the effect of potatoes in fattening hogs, but he could not succeed in fattening them by means of this food without adding some cake greaves, which are known to contain a considerable quantity of fatty matter. On the other hand, we have made experiments with hogs, which appear quite conclusive, and from which it results that, while two Hampshire hogs, after eating 30 kils. of gluten and 14 kils. of fecula, had only gained 8 kils.; two other animals of the same breed, the same age, and the same weight, which in the same time had eaten 45 kils. of cooked flesh of sheep's heads, containing from 12 to 15 per cent. of fat, had gained 16 kils.; nevertheless, judging from the elementary analy-

sis, these different sorts of food were equivalent. The first contains dry gluten 12 kils. + fecula 14 kils., the second contains of flesh deprived of moisture 9 kils. and fat 7 kils., thus the quantities of carbon and azote were even a little greater in the vegetable food, but these two rations differ materially in this, that the animal food contained a quantity of fat equivalent to that which the other contained of fecula.

In a second trial, four hogs, fed with boiled potatoes, carrots, and a little rye, had gained only 53 kils. 5, whilst four other hogs, of the same age and in the same condition, treated with a regimen of boiled sheep's heads, had gained 103 kils. We could not help being much struck with the circumstance that the increase of weight of a fattening animal being considered as containing 50 per cent. of water, 33.3 of fat, 16.6 of azotized matter, we arrive at the conclusion that the greater part of the fat is taken up into the tissue of the animal. Thus the first hogs had eaten 6 kils. 7 of fat, and had gained 5 kils. 2., the four last had eaten 8 kils. 4 of fat and had gained 6 kils. 7. We cannot conclude this paper without recalling the remarkable experiments by which M. Magendie has so well proved that the chyle of animals fed on fat food is itself very rich in fatty matter, and that under the influence of a diet rich in fat, the animals are subject to that affection of the liver which is known by the name of fat liver ("*foie gras.*") These facts have had a great weight in the examination which has led us to the opinions we have just expressed.

To sum up, we have found by experiment that the hay contains more of the fatty matter than the milk which it goes to form, and that it is the same with the other rations on which cows or milch asses have been put. That oil-cake increases the production of butter, but is liable to make it less solid, and may give it the taste of the vegetable oil when there is too great a quantity of this food in the ration. That maize possesses a power of fattening, dependent on the large proportion of oil which it contains. That there exists the most perfect analogy between the production of milk and the fattening of animals, as the bearers of stock had anticipated. That nevertheless the fattening ox turns to use less of the fatty matter or azotized substances than the milk cow. That this last merits, in an economical point of view, by much the preference, when the question is to get from a pasture the greatest amount of product useful to man. That potatoes, mangel-würzel, and carrots, only fatten in so far as they are joined with products containing fat substance, such as straw, the seeds of cereal plants, bran, or oil-cake. That equal weights of gluten, mixed with fecula and flesh rich in fat, produce an effect in fattening which

in the hog differs in the ratio of 1 to 2. All these results agree so completely with the opinion which holds that fatty matter passes in substance from the digestive canal into the chyle, and thence into the blood, the milk, or the tissues, that it is difficult for us to imagine on what fact can be founded the idea that the fatty matter is capable of being formed from any substance by the animal. We know perfectly that chemistry has succeeded in transforming bodies, such as amygdaline, into oil of bitter almonds, hydracyamic acid, &c. We know that it can convert salicine into oil of queen of the meadow, carbonic acid, &c., and we believe that by similar processes, under particular circumstances, certain vegetable matters may yield fat bodies under the action of chemical agents; but hitherto none of the phenomena of the economy of the higher animals give reason to think that such facts have any share in their digestion, in the formation of their chyle,* the production of their milk, or in the phenomena which take place during their fattening.

ON LIME AND ITS COMPOUNDS, AND THEIR INFLUENCE ON AGRICULTURE.

By Mr THOMAS ROWLANDSON, Liverpool.

AFTER the preservation and due application of farm-yard and other ordinary sources of putrescent manures, no matter connected with subjects of the like nature assumes so great a pecuniary importance to the agriculturist of the United Kingdom as that which heads this paper, as the expenditure for lime alone greatly exceeds what is paid for bones, guano, and other extraneous fertilizers. I am thoroughly convinced, from my own personal observation, that the value of the labour and capital expended on this article alone by farmers throughout Great Britain and Ireland greatly exceeds one million of pounds sterling—a startling amount certainly; but those who are acquainted with

* Numerous facts well worthy of serious attention have taught us that green forage is, in general, more favourable than dry for the production of milk and the fattening of animals. It would, doubtless, be curious and useful to determine the circumstances favourable to complete this assimilation, and what are their precise effects. This is a subject for very interesting researches. If we could have entered on it, we should have wished to connect the result of these comparisons of different diets with the remarkable facts observed by M. Magendie, which have brought to light notable differences between the nutritive powers of cooked meat and raw flesh; but such studies would have led us too far. We have preferred confining ourselves to the outline we had marked out, leaving to other experimenters to go deeper into these questions, but at the same time without giving up the pursuit ourselves.

its extensive use in the districts where it can be obtained with ordinary facility will, on reflection, be perfectly convinced of the correctness of the assertion. In this amount, however, I do not include the other sources of calcareous manures, (but whose action is precisely similar eventually, only more slow in their operation,) such as chalks, marls, &c. From this statement it will, therefore, be seen that it is a matter of primary importance that the nature of the action of calcareous manures should be fully understood by the British agriculturist.

No matter has given rise to so many and so warm disputes as the action of lime on land, some giving to this substance their warmest and most unbounded panegyrics, whilst others have with equal vehemence condemned its application in toto. At a future part of this paper I believe I shall be enabled to elucidate the causes from which arise these discrepancies in its action, and also to shew that each party, under particular circumstances, were perfectly right in maintaining their respective opinions regarding its use or inutility; I trust I shall also point out an unerring method by which parties may judge when calcareous substances are required; and I can now state, with the utmost confidence, that, after a most extensive practice and extremely extended sphere of observation, I have hitherto found this test a most *unerring one*, and will be found, on perusal, simple and unexpensive, and of such a nature that the most uneducated ploughman may easily be made to understand; and, should the future experience of others prove (as I firmly believe it will) the correctness of my observations, it will be found that at least nine-tenths of the value of calcareous manures are an utter loss to the farmer as at present applied, or, if of any value, not worth one-tenth of their cost; and for which other cheaper and more efficient substances could be applied with better effects. With this last preliminary observation I shall conclude my general remarks, and enter at once into the details of the subject.

It is impossible, in treating of lime as a fertilizer, to pass over without making some extensive observations respecting the various doctrines as to the action of "humus" as a source of nutriment or otherwise to plants. Indeed the beneficial action of lime has ever been attributed by all writers (except Liebig) *solely* to the compounds and action which calcareous matters have upon the substances called "humus" and "humic acid." I am also assured that, in the majority of instances where calcareous manures are found serviceable, their mode of action consists in forming compounds similar to those just alluded to, though I believe the reader will feel convinced, after perusing the facts which will be adduced in this paper, that the benefits derived by the farmer from the use of lime and its

y compounds, as chalk, marl, &c., are to be traced to a different mode of action to what has been asserted in the ınguine manner by all previous writers, the illustrious ı chemist, Liebig, being a partial exception to this general

.ttention has been more particularly drawn to this subject ing in former numbers of the Highland and Agricultural 's Transactions the two recent prize essays *On the Action* ıes *of Lime*, &c., from the respective pens of Mr Ander- ŀarthloch, Inverness-shire, and Mr M'Turk. As they both the commonly received opinions as to its mode of action, it necessary to make a few remarks on the two papers just to, more particularly as it may fairly be presumed, from cent production, that they contain not only the writers' ı, but also an epitome of all those who have preceded In doing so, however, I intend, whenever my opinions 'ariance with those propounded by these gentlemen, to ərbatim extracts from their respective papers, of sufficient 'or the reader to judge of the merits of the theories put by each. In the first place, Mr M'Turk states—

ɔm the time it (lime) is cooled, after it comes from the kiln, its affinity nic acid gas is very strong, and it will continue to attract it from the re till it is again united to a proportion equal to what was expelled by the of burning; and if this is allowed to take place before it is applied to the urns to a state comparatively inactive; and in proportion as it has been me, and placed under circumstances favourable for attracting carbonic t will have the power of acting upon, or disorganizing, the animal or vege- ıins which it encounters in the soil, and also of neutralizing any acidulous ıich may there exist.

then, is an agent which enables us to avail ourselves of the hidden stores ment which the soil contains; for when it is applied to the soil in a caustic washed in by showers of rain, and in its progress through the soil encoun- tion of inert, insoluble, but decomposable matter, which it acts upon in ınner as to effect its decomposition, and resolve it into three parts essen- rent in their nature and character; all which parts are contained in the ortion that can be decomposed—first, the gaseous; second, the soluble; , the residuary matter. It is the two first of these we are to regard as the cause of the increased fitness of the soil for the germination and growth lar plants.

ınderson also says—

in this state (quicklime) to soils containing organic substances, it enters with these substances, and forms compounds partially soluble in water. c substances contain abundantly carbonaceous matter and oxygen, and by these, the quicklime is gradually converted into a carbonate. He further en slaked, or in union with water, it is chemically styled a hydrate, and n the same way as quicklime in reducing or combining with organic sub- It retains no longer the same action; but, on the contrary, operates in *preventing* the too rapid decomposition of organic substances already of solution or approaching to it.

her on he says, alluding to the propriety of applying lime the fallow season—

When it immediately acts, as before stated, upon any insoluble organic substances which it may contain; and instead of remaining dormant, inactive, and useless, as these substances had been during the previous rotation, they gradually form combinations with the lime, which becomes partially soluble in water, and thus, when lime is judiciously applied to a fallow, it is one reason for a small quantity of manure sufficing. This, of course, will only happen when there has been an accumulation of fibrous and insoluble organic matter in the soil, which is always the case in newly improved land, and when the soil, though in cultivation, has more previously undergone liming, and more particularly if it contains in itself little native calcareous matter.

How can Mr Anderson reconcile the two statements just quoted, viz. *that quicklime enters into combination with organic substances and forms compounds partially soluble in water*, afterwards stating that, when slaked and formed into a hydrate, it operates in the *same way as quicklime in reducing or combining with organic substances*. Immediately after he says—"*It retains no longer the action*; but, on the contrary, operates powerfully *in preventing the too rapid decomposition of organic substances already in a state of solution*," *&c*. It must be evident to the meanest comprehension that the hydrate of lime cannot act at the same time in a similar and different manner to quicklime, which Mr Anderson states that it does, viz. in the double capacity of rendering *insoluble substances soluble*; and afterwards, *that it operates powerfully in preventing the decomposition of organic substances*, *&c*. I would not so much have enlarged upon this discrepancy were it not for the fact that Mr Anderson, like all other writers on the same subject, has not adduced one tittle of evidence to support the assertion that lime renders insoluble substances soluble or otherwise. It is, in fact, neither more nor less than mere assertion, and should be received by the agriculturist only as a theory unsupported by the shadow of a proof.

Sir Humphry Davy was the first who propounded the theoretical idea that lime acted as a fertilizer, by rendering inert and insoluble vegetable matter soluble, and almost every writer since has echoed the remark. No one has a higher estimation of the pre-eminent skill of the illustrious chemist just quoted than I have; I cannot, however, but remark, and I believe all who are acquainted with Sir Humphry's writings will agree with me in opinion, that Sir Humphry was by no means an enthusiastic professor of organic chemistry, as applied to physiology and agriculture; his *forte*, in fact, was of an entirely different nature. Sir Humphry's lectures were given at the request of the Board of Agriculture, and, considering the short notice given to him on the subject, possess a degree of merit (more particularly when we remember the previously utter want of knowledge and study of the subject) which must meet our warmest praise.

In the course of this paper I shall have occasion to advert ... subjects than the one respecting lime rendering

insoluble matter soluble, which have been repeated so often, and so parrot-like, that the mere repetition of the assertion has been received by the world as proof of its correctness. After this episodical remark, I will at once proceed with the subject, begging, however, that the reader will bear the quotations in mind, as I shall have frequent occasion to allude to them in a future part of this paper. The two essayists, Mr Anderson and Mr M'Turk, agree in *one* thing, that lime renders insoluble vegetable matter soluble, yet neither adduce any proof that such is the case, and I shall immediately proceed to shew that the statement is quite in discordance with facts. The following experiments were made in consequence of my being engaged some time ago in the reclaiming of waste-bog, and what is provincially termed *mountain** land in Ireland; and when it was an object of considerable importance, on the grounds both of expense and labour, to dispense with the alkali which forms the subject of this paper, some failures arising from not making use of lime in the reclamation of these heretofore barren lands, gave rise to a number of experiments, both in the field and the laboratory, in order to account for the same. In the course of illustrating them in this paper I shall, however, quote freely from several authors, (Liebig in particular,) whenever I may find a coincidence of opinion, or other matter illustrative of my views.

How the doctrine of lime converting insoluble organic matter into soluble food for plants became so wide-spread and so generally believed, is certainly astonishing, as there never has been the slightest shadow of a reason adduced in its favour. The only instance which I know such to be the case is, that if quicklime be applied to moist land abounding in vegetable matter, the heat evolved by the conversion of the quicklime into a hydrate may at times be so intense as to completely disorganize the vegetable matter surrounding it, and thus set at liberty the soluble inorganic matters present in the soil, which will, in such cases, mainly consist of the carbonate of potash, soda, &c.; but as this can always be done more cheaply and efficiently by the aid of torrefaction, we cannot admit of its being of much utility in that respect. Liebig has added another, viz., the property that lime has of setting free the soluble silicate, about which something will be said hereafter.

If lime renders insoluble matter in soils soluble, the question

* The term mountain, as applied to land in Ireland, does not mean that such land is placed on a hill or high mountain, but signifies such lands as in England and Scotland are termed wolds and moors, having a surface of from four inches to a foot in thickness, placed generally on an impervious and barren subsoil, the herbage consisting only of sedge and the coarsest grass, plentifully intermixed with a dwarf bushy heath.

immediately arises what is the nature of the compounds thus formed through its influence? No such soluble compounds have ever yet been discovered, nor in my opinion ever will be.

So intimately is the substance variously and impurely called humus, humic acid, &c., connected, both according to former theories and my present opinions, with the action of lime, that I shall proceed at once to take into consideration their connexion with each other, so far as their mutual affinities assist in adding fertility to soils. I shall, in the course of this inquiry, consider what I shall in future term "humic acid," as endowed with the properties usually applied to the "humus" of physiologists, as it is the only substance hitherto discovered amongst decayed vegetable organic matter, by me, in the course of my researches, which is capable of forming a compound with lime. Humic acid forms a deep-coloured brown solution with some of the alkalis (ammonia in particular) and alkaline carbonate, and may be precipitated from the same by the means of acids, and also by lime. Humic acid is a light flocculent substance, and, according to Sprengel, is soluble in 2500 times its own weight of water; combines with alkalis, lime, and magnesia, forming compounds of the same degree of solubility. So far as this remark applies to its combination with lime, I perfectly agree; but I have strong reasons to doubt that its compounds with other alkalis (potash, &c.) are so insoluble as here stated; and, on the contrary, its combination with the volatile alkali (ammonia) I can confidently assert is of a highly soluble nature. Liebig remarks, in that part of his "Organic Chemistry of Agriculture and Physiology" which treats of the assimilation of carbon, that if "we treat a portion of good garden mould with cold water, the fluid remains colourless, and is found to have dissolved less than 100,000 part of its weight of organic matters, and to contain merely the salts which are present in rain-water." Farther on he states, "and hence they (physiologists) have assumed that the lime, or the different alkalis found in the ashes of vegetables, render soluble the humic acid, and fit it for the process of assimilation."

"Now, let us suppose that humic acid is absorbed by plants in the form of that salt which contains the largest proportion of humic acid, viz., in the form of humate of lime, and thus, from the known quantity of the alkaline basis contained in the ashes of plants, let us calculate the amount of humic acid which might be assimilated in this manner." He afterwards proceeds to shew that in this manner 91 lbs. Hessian of fir wood per annum only could be grown on 40,000 square feet Hessian measure; whilst, in reality, 2,650 lbs. of fir wood are really produced during that period, and on the space named. I have quoted thus largely, because it most important in this question to bear always in mind, that

those theorists who assert that lime fertilizes in consequence of rendering inert organic vegetable matter soluble, merely contend that in this manner carbon is assimilated by plants, (Liebig's statement respecting the silicates being an exception,) and have adduced the above quotation to shew its utter unfitness in that respect. Again he adduces in further proof of his views—

The stalactic caverns in Franconia, and those in the vicinity of Bareuth and Strulbey, lie beneath a fertile arable soil. The abundant decaying vegetables or humus in this soil, being acted on by moisture and air, constantly evolve carbonic acid, which is dissolved by the rain. The rain water thus impregnated permeates the porous limestone which forms the walls and roofs of the caverns, and dissolves in its passage as much carbonate of lime as corresponds to the quantity of carbonic acid contained in it. Water and the excess of carbonic acid evaporate from this solution when it has reached the interior of the caverns, and the limestone is deposited on the walls and roofs in crystalline crusts of various forms. There are few spots on the earth where so many circumstances favourable to the production of *humate of lime* are combined, if the humus actually existed in the soil, as humic acid. Decaying vegetable matter, water and lime in solution, are brought together, but the stalactites formed contain no trace of vegetable matter and no humic acid. They are of a glittering white or yellowish colour, and in part transparent, like calcareous spar, and may be heated to redness without becoming black.

He also gives a further illustration, which it is unnecessary here to repeat. He afterwards, however, justly remarks—

In such a filtering apparatus, built by the hand of Nature, we have placed before us experiments which have been continued for a hundred or a thousand years. Now, if rain water possessed the power of dissolving 100,000th part of its own weight of humic acid or humate of lime, and humic acid were present, we should find the inner surface of the roofs of these vaults and caverns covered with these substances; but we cannot detect the smallest trace of them. There could scarcely be found a more clear and convincing proof of the absence of the humic acid of chemists in common vegetable mould.

The common view which has been adopted respecting the *modus operandi* of humic acid has given occasion to the following inexplicable phenomenon. A very small portion of humic acid dissolved in water gives it a yellow or brown colour; hence it would be supposed that a soil would be more fruitful in proportion as it was capable of giving this colour to water, that is, of yielding it humic acid. But it is very remarkable that plants do not thrive in such a soil, and that all manure must have lost this property before it can exercise a favourable influence upon their vegetation. Water from barren peat soils and marshy meadows, upon which few plants flourish, contains much of this humic acid; but all agriculturists and gardeners agree that the most suitable and best manure for plants is that which has completely lost the property of giving a colour to water.

Perhaps nothing has done so much to discredit, amongst the mass of farmers, the probability of profitably making the science of chemistry available for the purposes of agriculture, as repeated assertions made by chemists, either at variance or only partially founded on facts; yet such are continually to be found, not only in respect to this science as applied to agriculture alone, but the purely chemical works of the ablest continental and British chemists are all obnoxious to the same remark. The reason is, that it is impossible in the course of one man's lifetime to personally make experiments upon *all* the elementary substances and their

various compounds, both organic and inorganic; necessarily, then, a writer must in a great degree be dependant on the writings of others.

It is evident to me that Liebig never made the experiment respecting dissolving humic acid in water; or, if he did, it was neither spring nor distilled, but *rain water*, which he used for the purpose, and if rain water was used, he certainly ought to have particularized the same, as, in that case, the experiment would assume quite a different character to what it would do were either distilled or spring water used for the occasion. Besides, the assertion is totally opposed to the fact previously quoted in this paper, from Sprengel, and which experiment Liebig relies on mainly to disprove the fact of carbon being assimilated through the agency of "humic acid." His (Liebig's) admirable reasoning on this point has been quoted at length, and I beg the reader to refer to the same, in which he will find it stated that it (humic acid) is only soluble in 2500 times its own weight of water, and that its compounds with lime, magnesia, &c., are of the same degree of solubility. There cannot therefore be a doubt but Liebig has assumed, from the brown-coloured water making its appearance in peat bogs and barren morasses, that all waters, when macerated with such soils, have the property of doing so likewise. This he must have stated without having put the same to the test of experiment. The fact, however, is, though we macerate a portion of barren peat soil (abounding with humic acid) in spring water,* through a period of time extending to twelve months, not the slightest brown colour will appear—if the same soil be digested in hot spring water, only a very faint trace will be held in solution. This may seemingly appear in direct face of natural appearances, as all who are acquainted with the appearance of bog water clearly perceive that, when such lands are saturated to overflow with rain, that the water then existing in such soils has invariably a brown colour. I must here, however, remind the reader that this colour only takes place when such lands are saturated with rain water. Whenever a spring appears flowing through a peat bog, though that spring may have passed through a thickness of thirty or forty feet, the water issues as colourless, as bland, and wholesome, as though it proceeded from a rock of limestone. Not the slightest taste or appearance differs from the same water as it issued from the clay or substratum which forms the peat foundation. This apparent anomaly is easily re-

* By this ordinary spring water only is meant, such springs as, containing free alkalis and their carbonates, will produce the same brown colour, forming soluble humates. On the contrary, however, springs which contain what may be termed the earthy bases—lime, magnesia, &c.—will combine with the humic acid, and form insoluble humates, the water thus being left colourless.

conciled. Alkalis and their carbonates have, in general, the power of forming soluble compounds with humic acid, ammonia in particular. Now Liebig has distinctly proved the presence of ammonia, or its carbonate, in rain water, and it is owing to this presence of ammonia in rain water that the humic acid in such soils is dissolved, and, in consequence, presents that brown-coloured appearance so well known in bog water.

A few simple experiments, which any farmer may make at his own kitchen fire-side, will easily prove the correctness of the preceding assertion. Let him get a little turf from any unfertile morass, bog, or moor; place the same in a common wine or tall ale glass, (in order to make the experiment better, the turf or mould in all such experiments ought to be in the state of as fine a powder as possible;) afterwards pour on more than sufficient cold water to saturate the same; let him put it by for a week, a month, or a year, and at the end of each or any of these periods he will find the water as pellucid as when he commenced the experiment.* I have no doubt whatever that rain water, if used for the experiment, would produce similar results, as the small quantity of ammonia that could exist in the one-eighth or one-sixteenth of an imperial pint could barely be expected to make its appearance visible. If he, however, treat a like quantity of similar earth or turf† with hot water, it will in a short time receive a faint tinge of brown colour.

It is evident, therefore, from these appearances, that humic acid (existing to a great extent in peat bogs) is totally insoluble in cold water, which perfectly agrees with the characteristics given of it by former chemists who have examined its nature; for although it has previously been stated that humic acid is soluble in 2500 times its own weight of water, this is found only to be the case when newly precipitated, and, according to Sprengel, becomes completely insoluble when dried in the air, or when exposed in the moist state to the freezing temperature. Therefore the cold of winter and the heat of summer are equally destructive of the solubility of humic acid in cold water. If, however, we put a small quantity of liquor ammonia (spirits of hartshorn) in the water with which we intend to macerate the peat,‡ the characteristic brown colour of bog water will speedily make its appearance, and if the ammonia used be not in excess, the well-

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* Mouldiness might naturally be expected to occur, though I have never noticed such to be the case when *pure* spring water was used for the experiment.

† A piece of black turf or peat moss is the best for all these experiments.

‡ For the sake of uniformity, I shall in future, whilst detailing these experiments, consider that peat is always used, as it abounds the most in humic acid, and that hard black kind which makes the best fuel is also the fittest for the purpose. It is of the sort well known in Ireland as black turf.

known smell of this substance will have disappeared. It has, in fact, now combined with the humic acid in the peat, and formed the soluble inodorous humate of ammonia. The humic acid may now be precipitated by the acids. For the purpose, however, of experiment, we ought always to use the liquor ammonia without the addition of water, as it acts with so much greater energy—in a few minutes producing, wherever humic acid is present, a deep-coloured brown solution. It therefore appears that humic acid compounds are not so insoluble in all cases as stated by Sprengel; for, according to the above experiment, the humate of ammonia is a highly soluble substance. Potash, soda, and their carbonates, also form, according to my experiments, more soluble compounds than those stated by the same author.

The farmer having made the above experiments on barren soils, let him make precisely similar ones with some rich garden soil, formed from a morass which was in its original state of a like description as the one previously experimented on, and composed probably of ninety per cent. of vegetable carbonaceous matter. Let the same be macerated in cold or digested in hot water, not the slightest discoloration will take place however long the experiment may be continued. As it is not likely that every one will have equal facilities for making these experiments that I have had, it will probably be interesting to many of my readers to have repeated to them an illustration made on a large scale.

I possessed a farm in Ireland, consisting almost wholly of unreclaimed land, and what few acres had been cultivated previous to my occupancy of the same had also been of a like description, the whole having been part of a deep peat-bog extending over 500 acres, and had at one period varied from two or three feet to twenty feet in thickness, most of which, at the time I commenced my operations, had been cut away for the purposes of fuel, down to only about two feet in thickness. At the corner of a field which had been separated (in order to cut a new road) from the main part of the previously cultivated portion of the land, but abutting on that part on which no attempts had ever been made at reclamation, I fixed my garden, divided from the barren heath merely by a drain which had been [illegible] away the water from a spring rising in the centre [illegible] which otherwise would have overflown the road. [illegible] time this relates to, was only about two feet [illegible] though in the memory of many living had [illegible] teen feet deep, at which period it, previous [illegible] for fuel, formed a quaking bog, (through the influence of the spring just mentioned.) During the time I [illegible] ded at this place, [illegible] raised, through ordinary garden culture, [illegible] splendid crops of cauliflowers, carrots, potatoes,

turnips, cabbages, (many in the last summer fourteen lbs. weight and upwards each,) and all descriptions of culinary vegetables (I merely recapitulate these to shew the fertility of the soil) as could be desired. The process by which this garden soil had been reclaimed was paring, burning, and liming.

Although I did not actually test the matter, I am quite convinced that the soil of the garden just alluded to possessed at least ninety per cent. of combustible vegetable matter, and the unreclaimed, at the opposite side of the drain, possessed only a very trifling per cent. more vegetable matter, in consequence of not having had an application of lime. Let it be remembered by the reader that the whole had originally formed a continuous piece of waste, and the separation between the two pieces was merely the recent formation of a drain. On the one side we see utter barrenness, on the other high fertility. The barren side is now pared and burned; and an attempt made to grow crops—an entire failure ensues. The one side, after the heaviest rains, gives no further colour to water than the most fertile loams; the other side* gives, after the operation of burning, a deeper tinge to the rain water than it had done heretofore, and the land is found to be far inferior in fertility to that on the opposite side which had been limed. In fact the whole of the cruciform plants died almost as soon as they had vegetated. Having seen what has taken place in what may be termed the large scale, we will take a little of the soil from each and pursue our experiments in the kitchen. We lay our two parcels on the kitchen table, and procure from the dame two clean tall ale glasses, usually christened tall-boys. We have already procured from the druggist two or three pennyworth of ammonia, commonly called hartshorn. Here we are set up with as complete a laboratory for the present investigation as though an expense amounting to £20 had been gone to for the purpose. After marking what description of soil is placed in each glass, we pour a little ammonia over each, rather more than will cover the same, say about quarter of an inch. We sit down and mark the result—when the liquid in the glass containing a portion of the soil which has been only pared and burned will speedily appear of a deep brown colour, as before related. We await a little longer, to see if any change takes place in the glass which contains the rich garden (but limed) soil, but wait in vain; not the slightest appearance of change is to be seen. If the liquid in the last mentioned glass is now analyzed, we shall only find, in addition to the ammonia, a little potash, lime, &c., as the results. Not

* This was, no doubt, caused by the great quantity of carbonate of potash set free by the burning, as potash combines with humic acid, forming a humate of potash.

the slightest portion of carbon is held in solution, not a trace to be found. Now here is a complete contradiction to Mr M'Turk's theory of lime acting upon or disorganizing the animal and vegetable remains, rendering them soluble, &c., for which, see quotation. Mr Anderson also says, it (quicklime) enters into union with these organic substances and forms compounds partially soluble in water. Mr Anderson does certainly afterwards state the *modus operandi* to be different when converted into a hydrate, but as he does not give the slightest proof of its doing so, the agriculturist may take it for what it is worth, viz., mere assertion.

Well, we are not quite satisfied that this striking difference is occasioned solely by the use of lime. We will continue our experiments a little further. We pour out the contents of the glass containing the soil which gives the colour to the ammonia, and wash the same clean. We put a little of the unlimed part again into it—we have a bottle of clean lime-water ready for the occasion—we fill the glass to the brim with lime-water; we let the same stand, and by this time (always supposing the evening is used for these experiments) it will be time for bed. After a sound sleep, which the fatigues of the previous day have fully prepared us to enjoy, we rise with the lark in the morning, go to the glass left the night before, with the lime-water and peat, and give the same a shake up, then proceed to our ordinary business. After the breakfast is over, we snatch a couple of moments from our usual duties, we pay another visit to our glass, dip our finger in in order to taste the contents, and find that the strong alkaline taste so well known as lime-water has nearly, if not wholly, disappeared. If there is no perceptible taste of lime-water, we begin to think that it is time to see whether it is our senses have deceived us or that the lime-water really has disappeared. We go to the cupboard, (always safely locked, as the substance we are about to bring out is a deadly poison, and fatal results have ensued in consequence of having been mistaken for Epsom salts,) we procure a little oxalic acid, and dissolve a very small portion in cold water; we pour a little fluid from the glass in which the lime-water was placed over night into the vessel containing the oxalic acid in solution. Not the slightest change of colour takes place—a certain sign that the [illegible] the lime contained in the water has been absorbed [illegible] manner or other by the peat. Well, we continue [illegible] our experiment, daily pouring fresh lime-water [illegible] the peat, until at last (which will take some time, as [illegible] only held in solution in 780 times its own weight of water) [illegible], on decanting the fluid into the solution of oxalic acid, [illegible] milky appearance, and a heavy white powder (the oxalate of lime) is eventually precipitated. We know now that the

peat will absorb no more lime.* After this, we pour out the whole of the liquid from the peat and pour caustic ammonia over the same, and let it stand a few days to see if the brown colour will make its appearance, but no such thing occurs. Well, we have now arrived at this much—the application of lime prevents barren peat soils discolouring rain water, and all fertile soils have a similar property. We will try what liming will do.† We, therefore, lime the barren side, and procure most splendid crops of mangel, cabbage, cauliflower, mustard, and rape.‡ Should any reader be sceptical about this being the true mode in which lime operates in fertilizing soils, we will put him in the way of pursuing the experiments still further, and making the process visible. Let a little barren peat be macerated a short time in ammonia liquor, in order to procure some of the so-often mentioned brown-coloured solution which must afterwards be decanted into a clean glass ready for the purpose; then pour into the decanted solution some lime-water, when the whole, instead of the former transparent brown appearance, will become immediately turbid, and gradually a light flocculent precipitate of a dirty brown colour will separate, having (provided sufficient lime-water is used for the purpose) a perfectly clear liquid, and the humate of lime will be precipitated to the bottom of the glass, and can be obtained in a separate state by filtering the same through paper.

The humate of lime thus obtained for all practical purposes may be deemed insoluble.§ I think I have now fairly proved that, instead of lime rendering inert matter in soils abounding in carbonaceous matter soluble, its fertilizing effects are caused from quite an opposite operation, viz. the rendering a substance previously existing in such soils, which had a delete-

* This experiment can be performed by merely putting a little lime to barren peat soils; but in doing so the experiment is neither so elegant nor the *modus operandi* so apparent. So strong, however, is the affinity between the humic acid and the peat lime, that if we mix 100 grains of peat and ten grains of quicklime, and pour sufficient water on the same to render it quite moist, it will be found within ten minutes the mixture will cease to have the power of colouring the strongest liquor ammonia that can be procured, and will have all the properties of a rich garden soil.

† This portion of the paper is written in a familiar style merely to illustrate to those who may have a desire for information, but consider the nature or rather deficiency of their education incapacitates them for such experiments, that many experiments can be made of the most important description with the most perfect ease, and apparatus as simple as those above mentioned. In fact, I believe, and will attempt, in a future part of this paper, to prove, from the above experiment, the fallaciousness or truth of Liebig's theories as to the assimilation of nitrogen and carbon.

‡ These crops were absolutely obtained in the manner stated.

§ The humic acid may easily be procured in a free state by precipitating it from the ammoniacal solution by either the sulphuric, nitric, muriatic, or oxalic acids, when it will precipitate as a rather lighter flocculent substance, and of a paler colour than its compounds with lime or magnesia.

rious influence on vegetation* insoluble and inert, but which, before the application of lime, was soluble in the presence of some of the alkalis and their carbonates.

Next to (as I shall now take the liberty to term it) the common fallacy that lime renders inert organic matter soluble comes the opinion for consideration, that the infertility of such soils as we have just been treating upon arises from the presence of free acids, the tannic and oxalic having been stated by many to be present. The preceding part of this paper clearly shews, in my opinion, that there is always a free acid present, viz. the humic acid; and I consider the cause of peat, &c., remaining infertile after draining, is attributable mainly, if not solely, to the presence of this acid; and I have not discovered the presence of any other in the course of my investigation. I shall, however, say a few words as to the probability of the presence of these acids (the tannic and oxalic) in such soils as we have been investigating.

Mr Anderson says—" Peat *is known* to contain two substances inimical to vegetation, and eminently preventive of changes and interchanges, viz. the tannic and gallic acids;" and afterwards proceeds in a most singular, and far from a chemical, mode of reasoning, to shew that quicklime decomposes these acids in consequence of its having a powerful affinity for carbonaceous matter and oxygen. As I, however, dispute the premises, it is quite unnecessary to enter further into a criticism about Mr Anderson's mode of reasoning on the subject.

Now Mr Anderson has, doubtless, taken it for granted, from what has been stated by others, that the tannic and gallic acids *are* present in peat-bogs. It is impossible otherwise to conceive how he could assert such to be the case, which it will soon be seen is quite opposed to facts. It is highly improbable that he could have investigated the circumstance of its presence or not, else he would have known that neither the tannic or gallic acids are present in bogs, &c. The presence of these acids are easily tested, as they have the property of striking a deep black colour [illegible] salts of iron. Ink is manufactured in this manner [illegible] purpose of experiment, however, the protosulphate of iron [illegible] copperas) is always used when their presence [illegible] except for exceedingly delicate pur-

* [illegible] cumstances attending the growth of plants [illegible] which con[illegible] much free humic acid, I will adduce some facts which I [illegible] will prove that it is solely the presence of free humic acid in soils abounding in vegetable matter which is the cause of the barrenness of such soils; and further, that deficient draining on all soils favours the accumulation of humic acid. I [illegible]ll, however, as far as possible, separate the physiological portion of this treatise [illegible] reasoning.

poses, is quite adequate for the occasion. If, therefore, we mix a little sulphate of iron amongst bog water, or water that has been macerating turf for a long period, we should soon find, were such acids present, that the liquid would assume a deep black colour, forming the tanno-gallate of iron, (common writing ink.) In this way the presence of a very slight portion of tannic or gallic acids would be made perceptible. In such a mixture, however, not the slightest change takes place, as I have proved from numerous experiments.

It is evident to me that those who originated the theory were led to infer from the brown appearance of bog water, and its well ascertained antiseptic qualities, (both of which are so analogous to what takes place when tannic acid is present,) that no further investigation was necessary, and thus the error has been continued, uncontradicted, to the present day.

In like manner, it has been stated by some that oxalic acid is present in barren bogs and morasses. In candour, I must fairly state, that from appearances, which will be mentioned hereafter, I was long of opinion that such was the case, and various were the experiments I made in order to satisfy myself of its presence; on no occasion have I, however, satisfactorily perceived a trace of either, though it is difficult to conceive its being entirely absent, its most probable combination being the oxalate of potash. Were oxalic acid present, either in a free state or as an oxalate or binoxalate of potash, a most minute portion would be made perceptible when tested with lime-water, which would immediately assume a milky appearance. If we test bog water, however, in this manner, or water in which peat has for a long time been macerated, not the slightest appearance of oxalate of lime is to be seen. It may therefore be inferred that no oxalic acid is present. It is rather singular, and by no means uninteresting, to know that a great quantity of the newly cleared land in America is apparently as barren as our bogs, and probably from a similar cause, viz., the presence of humic acid. This was a matter with which I was perfectly unacquainted, until I recently procured a work from the Liverpool Agricultural Library, written in America, by Edmund Ruffin, Shillbanks, Virginia, and entitled *An Essay on Calcareous Manures*, 1835. It abounds with a number of practical observations, to which is added an appendix containing extracts from Braconnot, Berzelius, and others, all of which tend to prove the correctness of the opinions attempted to be established in this paper.

As it is a generally received opinion that the newly cleared lands in the United States are the most fertile imaginable, it will, no doubt, be interesting to a number of persons to know how the case truly stands. In order, therefore, to satisfy the curiosity

of such as may feel interested in the subject, I shall make some extracts from the work alluded to, especially as they are so pertinent to the subject. He says—

It will be sufficient for my purpose to shew that certain soils contain *some substances*, or possess some qualities, which promote almost exclusively the growth of acid plants. That this power is strengthened by adding known vegetable acids to the soil, and is totally removed by the application of calcareous manures, which would necessarily destroy any acid if it were present—leaving it to chemists to determine the nature and properties of this substance—I merely contend for its existence and effects; and the cause of these effects, whatever it may be, for the want of a better name, I shall call acidity.

The proofs now to be offered in support of the existence of acid and neutral soils, however weak each may be when considered alone, yet when taken in connexion, will together form a body of evidence not easily to be resisted.

1st Proof—Pine and common sorrel have leaves well known to be acid to the taste; and their growth is favoured by the soils which I suppose to be acid, to an extent which would be thought remarkable in other plants on the richest soils. Except wild locust, on the best river land, no growth can compare in rapidity with pines on soils naturally poor, and even greatly reduced by long cultivation.

Pines usually stand so thick on old exhausted fields, that the increase of size in each plant is greatly retarded; but if the whole growth of an acre is estimated, it would probably exceed in quantity the different growth of the richest soils, of the same age and on an equal space. Every cultivator of corn* on poor light soil knows how rapidly sorrel will cover his otherwise naked field, unless kept in check by continual tillage; and that to root it out, so as to prevent the like future labour, cannot be effected by any mode of cultivation whatever.

This weed, too, is considered far more hurtful to growing crops than any other of equal size; yet neither of these acid plants can thrive on the best lands. Sorrel cannot even live on a calcareous soil, and if a pine is sometimes found there, it has nothing of its usual elegant form, but seems as stunted and ill shaped as if it had always suffered from want of nourishment.

Again—

When pine leaves are applied to a soil, whatever acid they contain is, of course, given to that soil, for such time as circumstances permit it to retain its form or peculiar properties. Such an application is often made on a large scale, by cutting down the second growth of pines, on land once under tillage, and suffering them to lie a year before clearing and cultivating the land. The invariable consequence of this course is a growth of sorrel for one or two crops, so abundant and so injurious to the crops as to more than balance any benefit derived by this soil from the vegetable matter having been allowed to rot. From the general experience of this effect, most persons put pine land under tillage as soon as cut down, after carefully burning the whole of the heavy cover of leaves, both green and dry. Until within a few years, it was generally supposed that the leaves of pine were worthless, if not hurtful, in all applications to cultivated land, which opinion, doubtless, was founded on such facts as have been just stated; but if they are used as litter for cattle, and heaped to ferment, the injurious quality of pine leaves is destroyed, and they become a valuable manure.

He further states—

That my facts shew only the presence of one acid plant—sorrel—and that the acid which sorrel contains is not the acetic but the oxalic.

He also gives his opinion that—

The ingredient of soils which nourishes acid plants also poisons cultivated crops. Plants have not the power of rejecting noxious fluids, but take up by their roots

* Note.—The writers in the United States always allude to maize, or Indian corn, commonly called

everything presented in a soluble form. Thus the acid also enters the sap vessels of cultivated plants, stunts their growth, &c. &c. Also, when the poorest virgin woodland is cut down, it is covered and filled to excess with leaves and other rotted and rotting vegetable matters. Can a heavier vegetable manuring be desired? and as it completely rots during cultivation, must not it offer to the growing plants as abundant a supply of food as they can require? yet the best product obtained may be from ten to fifteen bushels of corn per acre, or five or six of wheat, soon to come down to half these quantities.*

If the noxious quality which causes such injury is an acid, it is as certain as any chemical truth whatever that it will be neutralized, and its powers destroyed, by applying enough of calcareous earth to the soil; and precisely such effects are found whenever that remedy is tried. On land thus relieved of this unceasing annoyance, the young corn no longer appears of a pale and sickly green, approaching to yellow, but takes immediately a deep healthy colour, by which it may readily be distinguished from any on soil left in its former state, before there is any perceptible difference in the size of the plants. The crop will produce fifty to one hundred per cent. more, the first year, before its supply of food can possibly have been increased, and the soil is not only found clear of sorrel, but incapable of producing it.

In a note he adds—

Sheep sorrel or *Rumex acetosa*. The wood sorrel (*Oxalis acetosella*) is of a very different character. This prefers rich and calcareous soils, and I have seen it growing on places calcareous to excess. It would seem, therefore, that wood sorrel forms its acid from the atmosphere, and does not draw it from the soil, as is evidently the case with common sorrel.

The preceding extracts are very interesting, as they shew that a quantity of what he terms the pine-land of America is originally of a barren and unfertile nature, and is only to be brought into a profitable state of cultivation by the same means as must be used in the old country to reclaim our water bogs and morasses, viz., the use of calcareous manures.

When, however, I come to treat of the subject physiologically I shall avail myself of a number of the illustrations just quoted, as they are precisely analogous to my own observations on peat soils. I cannot forbear remarking, however, that Mr Ruffin, in his treatise, never makes such random assertions as that the tannic, gallic, or oxalic acids are present, as he candidly admits that he has not been able to discover the same, modestly stating—" Leaving it to chemists to determine the nature and properties of this substance, I merely contend for its existence and effects; and the cause of these effects, whatever it may be, for the want of a better name, I shall call acidity."

It has been shewn, in the preceding part of this paper, that when the most delicate test, viz. lime, is used to discover the presence of oxalic acid in barren peat soils, not a trace is to be found; in fact, were oxalic acid present in such soils, rain water

* No very tempting prospects these for emigrants; and where labour is so dear as in the United States, such crops cannot possibly pay the expenses. It is evident, therefore, that any simple means of discovering this deleterious quality of soils, must be of the highest importance to persons leaving this country to embark their fortunes in the other hemisphere.

would cease to have the property of forming that brown-coloured solution so frequently to be seen in morasses, which colour is solely attributable to the presence of humate of ammonia. Now humate of ammonia and oxalic acid are incompatible with each other, decomposition always taking place, forming the oxalate of ammonia, and "humic acid" in an insoluble state, or nearly so, being precipitated.

The presence of oxalic acid in the sorrel, mentioned by Mr Ruffin, is solely derivable from the atmosphere, as will be shewn in a future part of this paper, when the physiological circumstances connected with the growth of plants on such soils come under consideration.

GUANO, ITS HISTORY AND USES AMONG THE PERUVIANS.

By Mr William Walton.

If anything could prove the backwardness, the distrust, with which, even in an enlightened country like ours, we adopt any new project, any untried expedient, opposed to our old habits and customs, it is the delay which took place in the introduction of guano. In the works of the early writers of Peruvian annals we had read of its value as a fertilizer, and admired the provident use made of it by the Incas, long before that patriarchal race of monarchs had been extinguished by their rude and ruthless invaders.* For a hundred years and more our navigators to the Pacific had noticed the guano islands, and seen cargoes of this excrementitious deposit conveyed to the contiguous mainland, where, if they went on shore, as in many instances they unquestionably did, they must have witnessed the greater luxuriance of the herbage, as well as the increased weight of the crops, where this peculiar kind of manure was applied to the soil. Our merchants who, ever since the declaration of independence, have had opportunities of forming establishments of their own on the coast as well as in the interior of Peru, often must have stopped to notice the use made of birds' droppings by the natives, and been amazed at the vegetable nourishment derived from them; nay, i

* Speaking [illegible] ancient agriculture of the Peruvians, Robertson, in his "America," has this passage—"They enriched the soil by manuring it with the dung of sea-fowls, of which they found an inexhaustible store in all the islands situated along their coasts." In a note he adds—"The Spaniards have adopted that custom from the ancient Peruvians, and continue to use the guano, or the dung of sea-fowls, as manure.

r reasonable to suppose that, among the number of our ·ymen engaged in various enterprises on the western coast ith America, even as early as 1815, there must have been few who imbibed certain principles while viewing the agri-e of the Peruvians, and, on their return home, communi-the result of their observations to their inquiring friends. › delay, therefore, could not have occurred through the of requisite information, more especially after Humboldt's made their appearance.* I myself cannot forget that, in I repeatedly mentioned the subject to persons of influence metropolis, among whom were the late Sir Joseph Banks ıe late Lord Sheffield. Sir Joseph listened with attention at I had to say, and I have reason to think that my con-ions at the time called back to his memory circumstances, cted with the use of guano, respecting which he, no doubt, ıed his first notions while visiting the Pacific with Captain To several agriculturists I related the rather extraordi-nanner in which I first became acquainted with the fertil-properties of birds' droppings, when an incident occurred drew my attention to the subject, and induced me, for ıl years afterwards, to lose no opportunity of procuring all formation I could upon it. That incident it may be worth briefly to record.

ıile residing in the Spanish part of the island of St Domingo, chased an extensive tract of virgin land, situated near the ə of the Ozama river, and about twelve leagues from the ıl, with the view of forming an estate under the superintend-of an old French colonist, and, as a commencement, deter-l to have 14,000 coffee trees planted. The ground selected g been cleared and the seedlings prepared, I proposed to a fortnight on the spot, in order to witness the operation, ıt the same time, by my presence, encourage the rural festi-usual on such occasions. To enliven the scene, I took with Peruvian Indian, a good musician, who had casually entered ·rvice, and who, from the singularity of his character, as

his return from South America, this celebrated traveller transmitted to Fourcroy & Vauquelin, of Paris, a sample of guano, accompanied by a short of his own, setting forth the appearances under which this natural manure is ·n islands contiguous to the Peruvian coast, its predominant properties, and s to which it is applied by the natives, &c. In this interesting paper is the ıg passage :—" La fertilité des côtes steriles du Perou est fondée sur le guano, un grand objet de commerce. C'est le mais, surtout, pour lequel le guano excellent engrais. Les Indiens ont enseigné cette methode aux Expagnols." 6, the two eminent chemists above named made a most careful and elaborate s of this substance, the results of which are published in vol. lvi. of the ıles de Chemie." They found it to contain one-fourth of its weight of uric ırtly saturated with ammonia, and small quantities of sulphate and muriate sh, and mixed with a portion of sand, partly quartzose and partly ferruginous.

well as his peculiar acquirements, deserves some preliminary notice, a task which gratitude almost imposes upon me; for I do not hesitate to confess that, when young, I derived more practical information from him regarding the country in which he was born than I could have done from any other source. The intercourse which I then had with him, in fact, gave a turn to my reading, and influenced my selection of books on Peruvian topics.

Raymundo, for that was his name, was a native of Huamanga, where he received a medley education from a friar, whom, besides lad of all work, he had served as an acolothist, till he was too full grown to officiate as such. Naturally studious, he availed himself of the opportunity of reading the books in his master's library, well stocked with those relating to the conquest and settlement of Peru, in the perusal of which Raymundo took great delight. He had accompanied the friar in religious missions to various parts of the country, and treasured up in his memory more traditional lore regarding the Incas and the early affairs of Peru than perhaps any other native. This travelled and observant Indian had been chosen to take care of the llamas destined for Josephine Buonaparte, which in 1800 it was proposed to send overland to a port on the Atlantic, the highest compliment that could have been paid to his intelligence. The animals were landed in the French part of St Domingo, and, after a little rest, shipped off to France, when Raymundo, declining to accompany them any further, and not finding a ready passage home, came to the city of Santo Domingo in search of employment. Finding him a most useful personage, I made him an inmate of my own house, and, as his character developed itself, had every reason to be satisfied with my acquisition.

With this companion I sallied forth on my coffee-planting excursion, and, on reaching the estate, our first care was to visit the *pépinière*, or seedplot, which proved to be in excellent order. In the afternoon, Raymundo went out with his gun to a neighbouring forest, and at dusk returned, much pleased, with a dozen of parrots, which he proposed to cook for supper, in the manner most approved of by his late reverend employer. He had told me long stories regarding Andes sheep, and often beguiled a leisure hour by describing to me the process of Peruvian agriculture, more especially that part of it which relates to the use of guano, and in confirmation of his statements would appeal to various annalists on the subject, whose works, through his recommendation, I procured. Supper being over, and while swinging in my hammock, Raymundo entered my apartment, and, apologizing for the intrusion, told me that he had a word or two to say, if I was not too much tired to listen to him.

Knowing my man, I felt convinced that something particular

appened, and from the mystery which marked his manner, he caution with which he spoke, seemingly not to be over-, I at once concluded there was some plot or other among egroes, a very natural inference to one so well acquainted the feelings of the slave population in the east end of the as I was, more especially when I called to mind that, at oment, we were only three white men on the spot, including undo, among twenty-five or thirty blacks, the greater part om had not been a year from Africa, and no other house half a league. Starting up, I at once asked whether any doings were going on, to which I received a negative r, accompanied by an assurance from my confident that he had to impart to me, instead of being unpleasant, relat- a seasonable *hallasgo*, or discovery, which would afford the of trying an experiment, according to the Peruvian n, in planting coffee trees. After reminding me of the times he had mentioned the valuable properties of guano, out as he had seen it done at home, "You have now," said an opportunity of testing my veracity;" and I noticed that untenance lighted up as he informed me that he had just out a small deposit of that kind of manure, close at hand, oncluded by urging a request to be allowed to try its y.

y half in Raymundo's secret, and at a loss how to imagine he could have discovered a guano deposit at so great a ce from the sea-shore as we then were, I confess that I me curiosity to be further initiated, although I entertained g like doubt of my informant's accuracy, so great was my ence in his intelligence and devotion. Having received from pledge that every facility should be afforded him, he ised next morning to gratify my expectations, and accord- at sunrise he conducted me to the forest where, the ous evening, he had killed the parrots, and, at a short ce from the path, pointed out to me a tall, stately, and looking tree, emphatically exclaiming, "There the treasure oncealed," at the same moment firing off his fowling-piece g the upper branches, when thousands of parrots, with a ndous scream, rose up into the air.

stantly caught the idea, and approaching the tree, on closer ction, was really surprised at its extraordinary appearance. woody pile far out-topped its neighbours, at the same time the branches extended to an enormous width. From the s of age, it seemed to be a primeval production, although in od a state of preservation that deservedly it might still be l the lord of the forest. The top was particularly remark- Owing to the number of creepers with which the upper

branches were interwoven, and the accun … of nests, it was completely matted together, and f… into a dark mass, from the sides of which hung various p…ts, the seeds having originally been carried up thither by the old birds to feed their young. Dropping, they had germinated in this rich parterre; and among the plants was the wild potato, the roots of which, resembling thin ropes, were trailing upon the ground, and carried up moisture to an elevation of seventy feet. I at once saw that what Raymundo called guano was no other than the accumulated emanations of some hundreds of generations of parrots, accustomed to congregate upon this spot, almost exclusively, to roost, breed, and die, and never till now molested; for, although this bird is considered good eating, it seldom comes within the sportsman's range where wild pigeons and guinea-fowls abound.

True to my promise, I gave directions that the whole gang of negroes should, next morning, be placed at Raymundo's disposal, in order to collect the ingredient sought for, and, by ascending the tree, with calabashes slung round them, and lopping off branches, in the course of a couple of days nearly 50 lbs. weight, in a tolerably pure state, were obtained, and with this little stock it was agreed that the proposed experiment should be tried. My old French *gerant* complained bitterly of this loss of time, ridiculing the idea of such stuff being serviceable as manure; but I persisted in Raymundo for once having his own way.

The ground allotted for the plantation extended partly down a gentle slope and partly along a wide valley at the bottom, thus presenting inequalities of surface; and the lines having been traced, so that the trees, when planted, would stand in rows seven feet apart, and the spots staked, in order to preserve regularity, 100 of these were left for Raymundo, half on the upper and half on the lower ground, that being the number to which he judged his stock of guano would correspond. Exultingly did the Peruvian set to work with his preparations; but, instead of dibbling, which he said hardened the ground, he dug a slanting hole, round the lower sides of which he sprinkled about half-a-pound of pulverized guano, and over it threw a little light mould, taking care that none of the compost should touch the root when the plant was …signed to the ground. Into each hole better than half-a-gallon of …ater was then poured, and the further process left till the …ing of the next day. The seedlings having been fairly taken …nt into the ground, and the holes filled up with light soil … of which was left a small depression, in order to make … most of any rain that might fall.

…n a few weeks the contrast with the plants set in the ordinary … became apparent. Those which had been guanoed recovered … the effects of transplanting much sooner than the rest

g a fresh and green appearance, while the adjoining ones, tively speaking, continued sickly. At the end of a isited the plantation, and was agreeably surprised to find do's *elêves* nearly a foot taller than the rest, stronger in , the tree better formed, and altogether wearing a more g aspect. Not a single one had died, and, although in the rest, the two patches could not be mistaken. That ower ground was the healthiest, a proof that, where applied, moisture has a beneficial effect. At the fall of , and when the rains were about to set in, Raymundo hat he should be glad to have it in his power to add und more guano to each plant, that being the practice as rees in his country; but I did not feel disposed to disther parrot-rookery, even if I could have found one. I ever, at the time, allowed him to collect together all the n nests left on the original tree, principally formed of ıd which had been saturated with successive droppings. s compost he prepared a corner of ground in a maizeproduce of which greatly exceeded that of the rest. cond year the plants served with parrot's dung had far en those set in the ordinary way, and seemed faster ing to maturity; but in the third, when the real test came und that the experiment had proved so pre-eminently l, that even my old and prejudiced French overseer help acknowledging his error, deeply regretting that lo had not had more scope. When gathering time h of the guanoed trees yielded from two and a-half to , in a few instances rather more; whereas the produce ıers, even the best of them, did not exceed from one and ırters to two lbs.; and the berry was, besides, lighter. In -field it had previously been ascertained that the difmounted to full thirty per cent., and a heavier grain had obtained, thus triumphantly establishing the fact that uviæ diffuse into the soil certain nutritive substances, their growth, plants imbibe, and thereon feed. At the e it was rendered apparent that these nutritive properıot confined to emanations from marine birds, or those ed to congregate on the Peruvian coast. Being merely al man, and no chemist, my instructor from the Andes, , was not prepared to account for this striking difference; atedly he assured me that such were invariably the ɔtained from guano in his country when applied to either getables, or grain, adding that with its aid flowers acquire brilliancy of colour, and also a strength which enables bear those alternations of temperature usual on the opes. Following up my researches, I have since had

numerous opportunities of ascertaining that, to the fullest extent Raymundo's information was correct.

It has very properly been remarked that the art of manuring consists in augmenting, by artificial means, the produce of any grain, tree, or vegetable entrusted to the earth for the purpose of production, at the same time taking care that the ingredients employed do not injure the soil. Like beings endowed with life it is universally admitted that plants require food, which they can only obtain through the medium of air and the earth, so that when found within their reach, each selects that which is best suited to its own assimilation. It consequently only remains to determine which is the peculiar pabulum or food plants require, and this must be done by a careful examination of their structure, followed by an analysis of the organs of vegetation and fructification, a task already performed by eminent botanists, and, applying the knowledge thus acquired to the art of manuring, it has been satisfactorily proved that a concentrated and azotized animal matter, applied to them in a combined state of ammonia, contains the largest portion of suitable nutriment, and is consequently calculated to accelerate and increase the productive powers of plants. It therefore follows that, in whatever substance we can find most of these essential properties, that substance is best adapted for manure. Stable dung has hitherto been considered the most fertilizing compound of which we can avail ourselves in this country, but if we can discover a substitute possessing the same properties in a greater degree, and, besides, more portable in form, it is evident that the interests of agriculture must be advanced by the acquisition. It has been ascertained that in 1000 parts of horses' urine there are 11 of carbonate of lime, 42 of alkaline salts, 7 of urea, and the rest water, while the same quantity of cow's urine gives only 5 parts of phosphate of lime, 24 of alkaline salts, 4 of urea, and the rest water, thus shewing that the first contains nearly twice as much alkaline salts as the second, and, consequently, in that proportion the fertilizing qualities of the one exceed the other.

Under date of February 1843, Dr Ure offered to the public the following as the average result of his analysis of Peruvian guano, in reference to its agricultural value, and subsequent experiments have proved that it is by no means over-rated. 1st, Azotized animal matter, including urate of ammonia, together capable of affording from 8 to 16 per cent. of ammonia by slow decomposition in the soil, 50.0; 2d, water, 11.0; 3d, phosphate of lime, 25.0; 4thly, phosphate of ammonia, oxalate of ammonia, and phosphate of magnesia, together containing from 5 to 9 parts of ammonia, 13.0; and, 5thly, siliceous sand, 1.0—total 100.

Such was the result obtained by a competent person from ordinary guano, brought to this country from Peru; but, as I shall hereafter have occasion to notice, its quality is by no means so good as that generally used by the natives.

In the simple comparison between horses' urine and guano, above presented, the preference in favour of the latter, when employed in the nutrition of plants, is rendered apparent. It, in fact, contains a larger proportion of ammonia, in a smaller compass and under the requisite combinations, than any other substance yet discovered in a natural state, and artificially the same ingredient, it is agreed, cannot be adequately formed. The value of alkaline salts, when applied to agriculture, is supposed to arise from their holding a larger proportion of oxygen in their composition than other substances, and from this circumstance the superior efficacy of birds' dung is derived.

The quality of animal dung materially depends upon the nature of the food habitually used. The richer and more nutritious it is, the greater will be the fertilizing properties of the emanations. Hence the dung of the race horse is more valuable than that of the drudge released from the cart and kept upon low fare. For the very same reason the excrementitious deposits of birds, feeding upon fish or flesh, afford a stronger manure than parrots, for example, because the latter live only on grain and berries. Maize, during a great part of the year, is almost exclusively their food, and the ravages committed by them on the fields planted with it are extensive. Their dung consequently approximates more to that of the race-horse. If we could find out the excrementitious leavings of any other bird or quadruped, containing more ammoniacal compounds than guano, and of which the supply is equal, then only should we possess an equivalent. This appears to be impracticable although it is a fact, analytically ascertained, that the dung of the boa-constrictor contains more ammonia than that of any other animal hitherto experimented upon.

It may, however, be expected that other deposits of birds' dung will, in the course of time, be discovered, either on the secluded shores of Africa or among the yet unexplored islands in the Pacific; nay, I feel convinced that there are other regions where it would be worth while for the inhabitants to seek it. According to recent accounts received from Jamaica, a cave had been visited which was found to contain a large deposit of birds' excrements, and it is thought that other similar ones exist on the island. The entrance is represented as being surmounted by massive piles of rock, thrown together in a wild and abrupt manner, possibly by some earthquake, and bearing a picturesque appearance. The descent is easy, and, when within, the visiter finds masses, several feet deep, and covering a considerable extent, of

a peculiar kind of earth, which, on examination, proves to be the excrementitious deposit of birds, the formation of which may have commenced at some early period after the flood. By some persons on the spot, this earth is thought to be the leavings of swallows, whose dung, as they live on insects and vegetables, would, no doubt, be found of a rich and stimulating quality; but I am inclined to think that this accumulation, avowedly the work of gone-by ages, may safely be attributed to a larger species of the feathered race. When the Antilles were discovered, they contained various carnivorous birds, such as are accustomed to roost in caverns, and which, as the surface of the land became uncovered and the population increased, either wholly disappeared, or are now only to be seen in the secluded recesses of the mountains. To birds of this class it is more probable that the rocky receptacle in question once served as a breeding place, although at present chiefly frequented by swallows. It is situated at Newmarket, near the town of Cornwall, and letters from the spot state that the attention of neighbouring farmers has already been turned to this deposit, who have made experiments upon what they call "cave-manure."

I have narrated the particulars of the little trial made, under my own inspection, with parrot's droppings in the Spanish part of the island of St Domingo, where everything is on a larger scale, and the feathered tribes much more numerous than in Jamaica. There, I can confidently aver, unexplored caverns exist, some of which formerly may have been the resorts of birds. Wild pigeons which, in the early days of the discovery, were general throughout the island, are now almost concentrated in the east end, owing to its being comparatively bare of population. Thence at sunrise they may be seen issuing in immense and successive flocks, taking various directions, and spreading themselves in search of food. In the evening they assemble, and wing their way back; and, should the wind blow from the north, and the weather prove lowering, the flocks keep near the southern coast, often flying so low that I have myself killed ten or fifteen pigeons in an evening from the top of my own house.* Wherever these birds roost there a deposit of droppings will be found. Nor is it to be supposed that pigeon's dung is to be disregarded. In some parts of Spain, more particularly in Catalonia, Valencia, and Aragon, it is much prized and carefully collected. Diluted with soft water,

* In July, 1809, at a moment when the British forces under General Carmichael were in front of the city of Santo Domingo, and the negotiations for the surrender of the place were going on, an incessant firing was suddenly heard. Alarmed at this circumstance, so extraordinary while the white flag was up, a party of light dragoons was moved forward, and an aid-de-camp sent in to demand the cause. The answer given was that the inhabitants were only firing at immense numbers of wild pigeons flying over the walls. This incident is stated in the General's despatch.

in the proportion of one ounce to a pint, it is applied near the roots of flowers, melons, tomates, and other plants, for which purpose two holes are made on the opposite sides, and about a teacupful poured into each, when the holes are filled up.* This expedient is also adopted in certain parts of Italy, as well as in the south of France; and the day may come when we shall value the sweepings of our pigeon-houses more than we now do.

During my last excursion to the Basque provinces, and at the time when the north of Spain had become the principal theatre of the civil war, while crossing the Haya heights, overlooking Oyarzun, I observed several large flocks of vultures, coming from the west, in the direction of the elevated summit upon which I stood, and, when above me, I could not help admiring their slow and majestic flight, as they moved through the air with scarcely any visible action of the wings. These birds, in immense numbers, for ages have been known to roost and breed on the *Pena de Orduña*, a broken cliff standing on the mountains which surround the town of that name. Here they procreate undisturbed, and at the peep of day are seen sallying forth in various directions to seek their prey, in preference to a late battle-field; and, about the period alluded to, so often had they been noticed upon the ground in the rear of St Sebastian, on several occasions strenuously contested by the Spanish Carlists with the British Legionists, that my guide very pertinently remarked to me that vultures and army contractors seemed to be the only beings benefited by the war.

Near Dima, I afterwards visited the cave of Balsola, in the Basque language meaning a dark region. This Avernean cavern, which more properly might be called a perforation through the side of a hill, extending to full three-quarters of a mile, is inhabited by ravens, myriads of which, as voices are heard and lights perceived within, issue from the crevices and crags, and, flying about, or perching on some projecting point, keep up such a hideous and deafening din, that for a moment the stoutest heart would quake; and yet these were only the old and disabled birds, accustomed to this home, or those sitting on their eggs, the younger broods being all out on a cruise, and no probability of their returning till nightfall. As it were to add to the effect, many thousands of enormous bats, resembling vampires, and their eyes glistening with a vivid brightness, were hanging in clusters from the roof, one by the other, like bunches of grapes

* The basketful, weighing from twenty to twenty-five lbs., usually sells for about two dollars. The *hortelanos*, or kitchen-gardeners, are eager purchasers, and find it answer amazingly well for cabbages, cauliflowers, pulse, &c. This kind of manure has been in use among the southern Spaniards for upwards of three centuries, and there is reason to think that it was originally introduced, on their return home, by some of the parties engaged in the conquest of Peru.

under a vine avenue, or fluttered their leathern wings about your ears. For ages, unmolested, those two races of winged animals have found a breeding-place within this cavern, and the accumulation of their dung is denoted not only by the nature of the ground, but also by the fœtid smell prevailing in the recess. Here, and at the Peña de Orduña, the Basques might find guano, in what quantity, of course, it would be impossible to state; but it is singular that those laborious and thrifty mountaineers, so well acquainted with Peruvian agriculture, and who understand the economy of manuring land better than any other people on the Continent, as is proved by the crops which they rear, have hitherto neglected these two resources.* Guano manure will, however, make its way among them as it is doing among us, in spite of the prejudices of the old school. It, nevertheless, appears strange that, since its introduction into the United Kingdom, and while so many pens have been busily employed upon the subject, while numerous experiments have been making by analytical chemists to ascertain the real properties of this old fertilizer, as well as trials of its effects by practical farmers, no one seems to have stopped to inquire into its history, or the manner in which it was used by the ancient Peruvians, to whom we are indebted for our knowledge of its application to agricultural purposes. Rude and homely as their method of tilling the land may be considered in the present advanced stage of society, and with our present scientific method of preparing the soil, nevertheless, in many respects, the Children of the Sun were a sensible and thoughtful people, and even their subduers found themselves obliged to acknowledge that they noticed among them provident laws and usages which would have done honour to nations of the Old World.

That the Peruvians had attained a higher degree of civilization, and were living in a better state of social organization, than their conquerors at the time were disposed to admit, is an opinion that fast gains ground. Their civilization, compared with that of Europe at the same period, was, it is true, simple and peculiar, but it had all the good effects which could be desired upon the community. Their system of religion was perfect, its exterior forms solemn and imposing,† and their national customs

* The western and northern islands of Scotland, as well as many rocky parts of the Scotch and Irish coasts, are frequented by numerous flocks of sea birds, and, consequently, in these resorts formations of their droppings must be going on, unless they are regularly washed away and lost. The spots selected usually are so precipitous and difficult of access, that proper search may not have been made for deposits; but this is a resource that should not be entirely overlooked.

† The progress made in industry and the arts, afford the best proof of the civilization which the Peruvians had attained. They manufactured gold, silver, copper, and lead. The two former were chiefly used as ornaments in their temples and in

strongly marked. The monarchical government of the Incas was established with such solidity, that without the slightest difficulty they, as well as the subordinate hereditary chiefs, in all grades, succeeded to their respective ranks, and held command, at the same time that the union of the civil and religious power gave to the supreme authority all that force required to ensure obedience. By means of municipal laws their towns were well governed and kept in good order, and by general enactments, equivalent to what might be called common law, property was secured, and, in lieu of taxes, the natives were obliged to contribute their labour in support of the state, specially in building temples and palaces, as well as in cultivating the lands and making bridges and roads. Resting-places, called *tambos*, were kept at the public expense in towns, as well as on the roads, wherein refreshment was afforded to the traveller. Finally, according to Garcilasso, no poor were seen begging among the Peruvians, and such of the lower orders as were without clothing, had the materials to make it provided for them.*

Their agrarian laws, as described by the same authority, were admirable. The lands were cultivated in common, and for the benefit of all, and this task being accomplished, they were divided into three portions, one of which was set apart for the priests of the Sun, another for the Inca, and the third reserved for the people. It seems to have been the particular study of the Peruvian rulers how to guard against the contingencies of famine, and we are assured that they took great delight in seeing their subjects unite in the field labour, as well as at seed and harvest time. In case the number of inhabitants had so much increased, since the original allotment of lands was made, as to require a larger provision for them, portions were always taken from the two first shares to supply the deficit, the great object of the government being that each family should always have a sufficiency of food in store. Great order was also observed in

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the Incas' palaces. Their pottery was of a superior kind, and many of their household vessels, still found in the *huacas*, or monumental mounds, used as burial places, resemble Etruscan vases. "Industriels (says D'Orbigny) ils ont poussé le tissage a un point de perfection, d'autant plus remarkable que leur metiers sont les plus grossiers. La finesse de leur tissus de laine etait réelment étouante, et aurait pu rivaliser avec les produits de nos manufactures. Ils n'etaient pas moins avancés dans les teintures de ces mêmes tissus; les couleurs les plus vives—le rouge, le jaune, surtout, etaient tellement fixés, que nous en avons trouvé qui bien que renfermés depuis dés siecles dans les tourbeaux, avaient conservé leur fraicheur primitif."

* In all the high lands the clothing worn was made of alpaca wool, given to the people by the Inca from his own flocks, which were innumerable. On the sea coast, where, on account of the heat, woollens are not used, the inhabitants made their clothing of cotton, grown on the Inca's lands, so that the workmanship only devolved upon the Indians."—*Comentarios Reales de los Incas*, Lib. v. Cap. vi.

the process of agriculture. The lands marked off for the Sun were first cultivated; next those of widows, orphans, and disabled persons, who ranked as paupers, and had the work done for them; and lastly, the portion destined for the Inca. To each head of a family a *tupu*, equivalent to rather more than an acre of land, for vegetables was besides distributed, with half a one for each child, which the female lost when she took a husband. In each town a royal commissioner resided, to see the regulations for the allotment and culture of the lands carried into effect, and under his directions the surveyors and measurers performed their respective duties.

Owing to the inequalities of the ground, as well as the immense tracts of sand extending along the valleys bordering on the Pacific, it became necessary to economize the disproportionate quantity of cultivable land which the dominions of the Inca contained, in order to enable him to comply with one of his first duties, viz., that of providing food and raiment for so large a number of inhabitants as those who owed allegiance to him. We have no means of stating, with anything like accuracy, the population of Peru prior to the conquest; but there are ample records to shew that, through the wars, the introduction of European diseases, and the *mita*, or system of compulsory labour in the mines, the loss of life among the indigenous tribes must have been enormous—on the lowest estimation, five millions. According to an official paper,* puplished at Lima in 1812, it appears that, immediately after those disturbances had terminated, which followed the establishment of Spanish power in Peru, that is, in 1551, orders were given to take a census, to be made of the Indian population in that vice-royalty, when the returns made amounted to 8,285,000 persons of both sexes. "Who would believe this," says the same authority, "when he reflects that within the 200 leagues of territory, extending from Tumbez to the extremities of Buenos Ayres, there are not now (1812) 2,000,000 of Indians, and that, in the whole Peruvian provinces, it would not be possible to muster even as many as 700,000 male and female," (meaning the pure races.)†

It would not, therefore, be overrating the aboriginal population of Peru, if we set it down at from 13,000,000 to 14,000,000 of persons for whom food was to be provided. The earnest endeavour of the government accordingly was, in the first place, to increase,

* Prologo respectivo á la Ilustracion de la Relacion del Govierno del S. Virey, D. Manuel de Arnat, &c., printed among the *Monumentos Literarios del Peru.*

† In 1793, the Peruvian population amounted to 1,076,997 souls, of whom 293,061 males, and 315,851 females—total, 608,912—were Indians. The Spaniards amounted to 67,325 males, and 68,986 females—total, 136,311. The rest were blacks and races.—*Guia de Lima.*

as much as possible, the quantity of cultivable land, and, in the second, to render the whole as productive as art and ingenuity could make it. In the upper habitable parts of the Andes, where grain ceases to grow, owing to the bare and broken surface, no other space could be found for the cultivation of the *yuca*, potatoes, and other edible roots, upon which the natives chiefly depended for their winter's stock, than the valleys and dells covered with the vegetable soil brought down by the rains. Except in the *yungas*, or hollows, the slopes were marked by great sterility, while the narrow and level strip of coast extending along the Pacific, on a width of from one to three leagues,* was composed of sandy plains, intersected with small valleys, which owed their productiveness almost entirely to the manner in which the lands were managed. Owing to the great inequalities of surface, the temperature of the air in these several regions also varied greatly, even under the same latitude.

With these difficulties the ancient Peruvians had to contend in providing a sufficient stock of food. On the habitable parts of the *Sierras*, where Reamur's thermometer frequently falls 3 degrees below 0, and rises 9 above it, scarcely anything else besides edible roots, *coca*, † and jesuit's bark would grow. On the slopes, where the population was more concentrated, maize, oca, (*oxalis*,) and *quinua*, (millet,) were chiefly cultivated; while in the valleys below the natives reared vegetables, fruits, and cotton—on those spots where the vine, olive-tree, and sugar-cane now thrive in luxuriance. Ingenuity thus became necessary to make up the deficiency in the lands suited for cultivation. On the abrupt slopes, where a portion of the soil was good, but liable to be carried away by the descending torrents, the aborigines built *andens*, or tiers across, supported by large and uncemented square stones slanting inwards, and, in some instances, these terraced plots were partly filled up with earth, brought from afar on the llama's back, when they were levelled so as to afford the largest possible surface. These mounds sometimes began near the top of a slope, and were continued in succession to the bottom,

* This space is covered with layers of sand intermixed with pebbles, resembling the bottom of the ocean. From these appearances it is concluded that at one time the sea must have come three leagues higher up than it now does, a circumstance from which the Polynesians derive an additional argument in support of their favourite theory. Through the accumulations of vegetable earth, brought down from the mountains by the torrents, many parts of this sandy strip have been covered from one to two feet in thickness, and on these spots it is that the lowland cultivation is chiefly carried on.

† *Erithroxylon* of Peru, a small shrub, the balsamic leaf of which the natives chew with an alkali, as they do the betel-nut in the East Indies. So much is this leaf in request, that 3,000,000 lbs. of it are annually grown in Peru, and upwards of 30,000,000 in the inland provinces of Buenos Ayres, estimated at 2,500,000 of dollars.

presenting so many green semicircles, having the appearance of hanging gardens, singularly contrasted with the intervening spaces bare of mould.

To the upper, and, consequently, in gradation to the lower rows, *asequias*, or canals of irrigation were formed to carry water, for the supply of which rivulets and cascades were often diverted from their natural channel, and carried by circuitous aqueducts to the main reservoir, in some instances a distance of fifteen and twenty leagues. In the distribution of this water the greatest regularity and economy were observed, in order to render it equal, and at the same time prevent waste. Each proprietor was allowed a certain time to have the supply running on,* according to the size of his plot, and if he did not attend to open the sluices to receive the water, and, when his time was up, to turn it off, he rendered himself liable to punishment. In this distribution no preference was shewn to the higher orders, or nobility. All fared alike, and instances are on record of commissioners having been punished for an infraction of this rule.

To these mountaineers agriculture was in fact a real existence; but, besides their seed lands, they also by the same process watered their pastures, on which, as Garcilasso tells us, they had immense numbers of cattle, meaning llamas and alpacas. The obelisks and statues of Tiahunakû, as well as the mausolea of Chachapoyas, seem to be works almost intended to defy the edge of time and devastation, not only on account of the solidity of the materials employed in their construction, but also the situations in which they were placed—sometimes on the top or side of a precipice—where the difficulty of access would guard them from the inroads of man. These, together with the ruins of Pachacamac, the edifices of Cusco and Quito, the fortresses of Hirbay and Cajahuna, the remaining abutments of bridges, and the roads cut through parts of the Cordilleras, attest the skill of the Peruvians in civil and military architecture; while the fragments of the aqueducts of Lucanas and Condesuyos, as well as of others, still preserved, which, in the midst of precipices, conducted refreshing streams from great distances to their seed lands, afford ample testimony of that proficiency which they had attained both in hydraulics and agriculture.

Besides the artificial ground, formed, in the manner above described, along the slopes on the coast where it seldom or never rains, and where, as before stated, the land is covered with layers

* The ancient Peruvians had a method of calculating time with great precision, and among them astronomy was studied at the expense of government. Several pillars, erected by them, pointing out the equinoxials and solstices, and also recording observations regarding eclipses, still exist. Under the Incas the study of medicine was also highly favoured.

of sand, the Peruvians dug *hoyos*, or holes, sometimes at a short distance from the high-water mark, or, in other words, they uncovered large patches, to the depth of two and three feet, not only to collect the drippings constantly oozing down from the mountains, where the rain falls in torrents, but also to economize any humidity that might arise from the vicinity of the sea. These patches were staked round, or hedged with the prickly pear, in order to prevent the sands from drifting upon them, and then cultivated like so many gardens. But of little use would have been these efforts to increase the quantity of cultivable land, in order to make provision for the wants of so large a population, if the Peruvians had not been blessed with the means of adding to its fertility. In this respect it seems to have been one of those wise dispensations of Providence, whereby a store of ready and efficient manure was laid in for a poor and arid country, where without it the inhabitants never could have found adequate subsistence, a benefit for which their rulers taught them always to feel grateful, and never waste the seasonable gift thus bestowed upon them by the Supreme Being to whom their adorations were addressed.

AGRICULTURAL REPORT.

September 1844.

On taking a retrospective view of the weather of the last half year, (for that period must be embraced in this report,) we cannot say that this has been a fine summer—certainly inferior to last, and very much inferior, on comparing different seasons, to the later portion of last winter. An early drought set in in spring, which was favourable enough for the cleansing process, but it continued so long, that the growth of the spring-sown crops was much affected by it, though it was just the sort of weather in which wheat delights to luxuriate. The dry weather continued in the south of England to a greater or less degree, with sunshine and warmth, till an early harvest arrived, and a crop of wheat of fine quality was reaped. Not exactly so was the case in Scotland. Rain made its appearance at the end of June, and it came most opportunely for the barley and oats, and pasture on deep land, though these on light poor soils had received such a check as to render it improbable for them to become thick on the ground. St Swithin kept his word, and poured forth his ready tears for forty days. The popular opinion regarding St Swithin's Day is founded on correct observation, though it is incorrect to believe that rain falling or otherwise on that par-

ticular day is an infallible prognostic of the weather for th succeeding six weeks. Before a certainty of rain or drought indicated it must fall or be fair for three or four days before an after the Saint's day. Immediately on the expiry of the s weeks, on the 24th August, the air cleared up, and we enjoy the most delightful heat and sunshine for a fortnight—the on true summer we had during the season, with the exception of week in the early part of July. A heavy rain on the 7th September put an end to the heat, and, we suspect, to the wa weather for the season. The peculiar feature of this season l been *coldness*—at one time drought with a N.E. and E. wi and another time rain with a N.W. and W. wind—the prev ing points, however, being cold, between N.W. and N.E.— mornings frequently cold and clear, with heavy dew, and the d succeeding to such, rainy and somewhat mild.

The effects of such a state of the atmosphere may easil traced upon the crops. The early drought stinted the s grasses so as to force them into early flower, and in consequ the hay was short and light. The rain came in time to the pasture, but continuing as it did, the stock was able to l down the grass as it grew, full of moisture and devoid of firm The effect, in short, on the pasture, for the season, has been same as that produced by overstocking. The rain also can time to save the spring-sown crops, both barley and oats re ing a considerable quantity of moisture to bring them to developement; and the consequence has been that both spec crop are, upon the whole, good, though instances of he stooked fields, such as might have been observed last yea rare in this, nor is the straw of so rich a colour. The rai brought away the red clover that was awanting in the hay has made the second cutting of considerable value. The cause has given rank stems to beans and pease; and as crops are usually too thick sown in this country, podding c be expected to extend itself all down the stem. As t wheat, it was far advanced before the rain made its appea and the immediate effect of the moisture was, of course, to the straw shoot out in length considerably, and thereby i the period of blooming and of maturity of the grain, a ultimate effect, we suspect, has been to render the quality grain inferior; for, although we entertain no fears whate the yield of the crop, we cannot imagine, in the absence s of enriching heat and pure sunshine, that the grain can be wise than thick-skinned.

We do not remember of a more favourable season tha or promoting the *growth* of the turnip plant, and the ence is that the portion of the crop sown in due seasc

an abundance of luxuriant leaves—the sure forerunners of well-shaped bulbs, which will make their appearance next h. The late-sown turnips are not looking well, the rain ng the plants to sit up, and preventing the cleaning and ing of the ground. The delay observed in the sowing of the of the crop was partly occasioned by the rain, which should warning for the future to have the land always ready in due n, and, whatever may be the state of the forthcoming ıer, the farmer could not then be taken by surprise; and it was owing to the want of guano, the shippers not being able to their engagements with the farmers at the promised time. ıave heard of considerable inequalities being observed in the of the crop raised with guano. We suspect that the nature s manure is not so generally understood as it should be. It d be universally known that it will inevitably destroy the ty of every seed sown in contact with it. Now, the usual of applying guano is in sowing it by hand either on the surface, and then drilling the land, or upon the drills, and splitting the drills. In either case the guano is pushed by osom of the plough in a line along the bottom of the drill, and d the seed sown afterwards be so deep as to reach the line of at once, it will run the risk of being deprived of its vitality; and t some seeds are so destroyed, others are not, and hence the ılarity in the springing and permanent blanks in the crop. safest plan, we conceive, of using this valuable, though dan-ıs manure in the hands of unskilful people, is to sow it by upon the level surface, to harrow it well into the soil with a e tine, and then to drill up the land, each drill with a bout, the manure and soil cannot fail to be well mixed together, mongst which the seed may be sown in safety. The same ıer that has favoured the growth of turnips has also rendered otato crop a good one, many of the blanks observable having filled up a few months ago. Of course those portions of the will not be so prolific as the rest, still they will yield good and should be kept apart for that purpose from the rest of rop.

is will not be a fine grazing season for stock, their food hav-een stinted in the early part of the season, and afterwards nted to them in a moist and soft state. Notwithstanding, derable profit may be derived from grazing, as prices of both and sheep, and of wool, have continued to advance, and sort of market for stock may be characterised as brisk.

examining the prices of wheat from the last harvest to we are surprised at the small degree of fluctuation that has place during that long period, the highest price in the Edin-h market being 65s., and the lowest 48s. 9d. per quarter, the ence being only 16s. 3d. per quarter.

The orchard fruit is prolific this year, t [illegible] son of blossom and of setting in May having been fine, and [illegible] ubsequent rain having assisted in swelling it to a proper size.

The hill-sports have been trying to sportsmen this season, the grouse being full grown—no cheepers—strong on the wing, and clubbing early in packs. As Scotchmen, we ought to be proud of our country possessing such temptations in sport as to induce our Gracious Queen and Her Royal Consort to visit us again so soon for the express purpose of witnessing them. We are glad to say that our old fellow-townsmen in Dundee have earned for themselves immortal honour in giving so hearty a welcome, and in displaying so true a spirit of loyalty to her Majesty on her making a landing place of their spacious and beautiful harbour.

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th July 1843 and 5th of July 1844—shewing the Increase and Decrease on each head thereof.

	Quarters ending July 5.		Increase.	Decrease.	Years ending July 5.		Increase.	Decrease.
	1843.	1844.			1843.	1844.		
	L.	L.	L.	L.	L.	L.	L.	L.
Customs, ...	4,557,206	4,869,235	312,029	. .	19 934,809	19,770,158	[illegible]	. .
Excise, ...	3,030,113	3,115,592	85,479	. .	11,545,529	11,965,606	420,0[illegible]	. .
Stamps, ...	1,659,910	1,705,033	46,023	. .	6,445,370	6,518,062	72,6[illegible]	. .
Taxes, ...	1,984,831	1,989,874	5,043	. .	4,191,129	4,197,516	6,3[illegible]	. .
Post-Office, . .	145,000	155,000	10,000	. .	598,000	632,000	34,000	. .
Miscellaneous, .	1,496,024	452,167	. .	643,857	1,767,541	638,140	. .	1,1[illegible]
Property Tax, .	861,709	752,485	. .	109,224	3,317,997	5,247,063	1,929,06[illegible]	. .
	13,333,893	13,039,406	458,574	753,061	46,800,390	48,909,142	3,298,16[illegible]	1,15[illegible]
	Deduct Increase,		. .	458,574	Deduct Decrease.		1,154,[illegible]	
	Decrease on the Qr.			294,487	Increase on the Year,		2,143,[illegible]	

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1844.							
June	Danzig.	36/ to 40/	15/6 to 17/6	9/ to 12/	16/ to 18/	19/6 to 22/	[illegible]
July	..	33/ 36/	16/ 18/	9/6 13/	16/6 18/	20/6 23/	[illegible]
Aug.	..	30/ 33/6	17/ 19/6	9/ 11/6	16/6 18/6	21/ 24/	[illegible]
June	Hamburg.	33/6 37/6	16/6 19/6	10/6 13/	21/ 24/	18/6 21/6	[illegible]
July	..	33/ 38/	18/6 21/6	10/ 12/6	22/ 25/	19/ 22/6	[illegible]
Aug.	..	32/ 38/6	20/ 23/	11/ 13/	20/6 24/6	20/6 23/6	[illegible]
June	Bremen.	34/ 38/	16/6 18/6	11/ 13/6	17/ 19/6	19/ 21/6	[illegible]
July	..	36/ 40/	18/6 21/6	11/6 14/6	18/6 21/6	19/6 22/	[illegible]
Aug.	..	42/ 46/	21 24/	12/ 16/	19/ 22/	25/ 30/	[illegible]
June	Königsburg.	34/ 40/	16/6 20/	10/ 12/6	16/6 21/	18/ 20/6	[illegible]
July	..	32/ 36/6	17/ 23/	10/6 13/	18/ 20/	19/ 22/	[illegible]
Aug.	..	30/ 34/6	16/ 21/	10/ 12/	17/ 19/6	20/ 24/	[illegible]

Freights averaged from 3/ to 4/2 per quarter to Great Britain.

TABLE OF PRICES, &c.

…es of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets :—

LONDON.

Barley.		Oats.		Rye.		Pease.		Beans.	
s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
31	7	21	10	33	6	33	4	31	3
30	11	22	2	32	8	34	6	35	1
36	0	22	10	32	2	35	2	35	9
31	2	22	11	33	0	35	10	36	7
33	11	23	2	34	4	36	4	35	8
35	1	23	3	35	8	36	8	37	3
34	2	21	11	36	2	37	4	36	5
35	3	21	9	35	4	37	8	37	1
36	11	20	4	34	8	37	10	37	4
36	8	19	10	33	9	36	4	36	8
38	6	19	8	35	6	36	2	31	1
38	2	19	3	36	2	35	6	30	6
32	5	19	7	35	9	31	2	30	5
35	7	19	11	35	6	31	10	33	7

EDINBURGH.

Date.		Wheat.		Barley.		Oats.		Pease.		Beans.	
1844.		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June	5.	59	6½	33	7½	21	5½	36	2	35	11
	12.	58	4	33	2½	24	3½	35	1	35	7
	19.	59	4	34	7½	23	6	36	2	36	6½
	26.	58	7	34	3½	22	8	35	3	35	10
July	3.	57	6½	34	6	22	10	35	6	36	0
	10.	57	7	32	6½	23	6	35	8	36	2
	17.	55	8	31	7	24	4	35	6	36	2
	24.	56	2	35	7	23	9	36	2	36	0
	31.	54	9	34	8	23	5	34	1	36	6
Aug.	7.	55	6	35	7	22	7	36	0	36	5
	14.	56	5	34	2	22	9	35	2	35	7
	21.	57	2	32	9	22	11	36	0	36	5
	28.	57	0	30	2	23	4	35	0	35	6

LIVERPOOL.

Barley.		Oats.		Rye.		Pease.		Beans.	
s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
29	11	20	4	33	1	32	4	34	11
32	0	20	7	32	9	33	6	36	4
31	4	21	5	33	4	34	8	36	6
30	6	21	9	34	6	36	2	37	3
29	6	21	4	35	2	36	6	36	10
31	10	21	3	35	8	36	2	36	7
31	6	22	6	35	1	35	4	34	7
30	10	20	10	36	6	36	8	38	8
30	2	21	8	37	4	37	9	37	6
28	8	19	10	37	2	37	3	37	9
29	10	20	10	36	8	36	4	36	7
31	7	19	9	35	9	36	0	37	10
31	10	19	7	34	4	35	6	35	4
32	3	25	4	35	2	36	6	38	10

DUBLIN.

Date.		Wheat per Barrel 20 St.		Barley per Barrel 16 St.		Bear per Barrel 17 St.		Oats per Barrel 14 St.		Flour per Barrel 9 St.	
1844.		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
June	1.	32	2	14	7	12	4	11	9	18	1
	8.	31	1	14	5	12	6	11	10	18	0½
	15.	32	0	14	4	12	10	11	4	18	0
	22.	31	0	14	8	12	6	11	6	18	0
	29.	32	6	14	9	12	8	11	8	18	1
July	5.	32	7	14	10	12	9	12	0	17	10
	12.	31	0	15	3	13	0	12	2	17	9
	19.	30	8	15	6	13	4	12	1	17	7
	26.	29	4	15	4	13	6	11	4	18	10
Aug.	2.	28	2	15	7	13	2	10	10	17	1
	9.	28	0	15	10	12	3	11	0	17	0
	16.	28	6	16	2	12	0	10	9	17	1
	23.	28	11	16	6	11	11	10	6	17	0
	30.	26	6	16	6	11	10	10	4	16	10

…ng the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. …and 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties payable …GN CORN: the Duties payable thereon, from June 1844 to September 1844.

…t.	Duty.		Barley. Weekly Average.		Barley. Aggregate Average.		Barley. Duty.		Oats. Weekly Average.		Oats. Aggregate Average.		Oats. Duty.		Rye. Weekly Average.		Rye. Aggregate Average.		Rye. Duty.		Pease. Weekly Average.		Pease. Aggregate Average.		Pease. Duty.		Beans. Weekly Average.		Beans. Aggregate Average.		Beans. Duty.	
d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
6	17	0	30	5	31	4	7	0	21	7	20	9	6	0	34	0	31	9	10	6	33	4	34	9	10	6	34	10	32	11	10	6
6	17	0	31	4	31	1	7	0	21	11	21	1	6	0	32	11	32	2	10	6	34	1	32	4	10	6	35	11	33	8	9	6
7	17	0	31	10	31	2	7	0	22	6	21	5	6	0	32	4	32	5	10	6	34	2	32	10	10	6	36	11	34	7	8	6
6	17	0	32	8	31	4	7	0	22	8	21	10	6	0	34	9	32	10	10	6	35	2	33	4	9	6	37	10	35	5	7	6
8	17	0	34	10	31	10	7	0	22	9	22	1	6	0	35	0	33	6	9	6	36	1	34	1	8	6	38	0	36	3	6	6
8	17	0	34	5	32	6	6	0	22	11	22	5	6	0	35	1	34	1	8	6	36	0	34	11	8	6	38	2	36	11	6	6
6	17	0	34	0	33	2	5	0	22	3	22	6	6	0	34	2	34	2	8	6	37	3	35	6	7	6	37	8	37	5	5	6
3	17	0	34	5	33	8	5	0	21	5	22	5	6	0	36	4	34	6	8	6	37	4	36	1	6	6	37	7	37	8	5	6
9	18	0	34	2	34	1	4	0	20	10	22	2	6	0	33	9	34	9	8	6	37	6	36	7	6	6	37	1	37	9	5	6
0	18	0	34	0	34	4	4	0	20	3	21	9	6	0	31	6	35	4	7	6	36	5	36	10	6	6	34	7	37	2	5	6
10	18	0	34	6	34	5	4	0	20	1	21	4	6	0	35	9	35	5	7	6	34	2	36	6	6	6	35	0	36	8	6	6
9	19	0	34	8	34	6	4	0	20	0	20	10	6	0	35	11	35	7	7	6	33	7	36	0	6	6	35	7	36	3	6	6
0	19	0	33	3	34	2	4	0	20	4	20	6	6	0	36	8	36	0	6	6	34	[illegible]	35	5	7	6	35	10	35	11	7	6
6	20	0	34	11	34	3	4	0	20	7	20	4	6	0	34	2	35	8	7	6	34	10	34	10	8	6	37	0	35	10	7	6

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof, from 5th June 1844 to 5th August 1844.

Month ending	IMPORTED. From Foreign Countries.	IMPORTED. From British Possessions.	IMPORTED. Total.	CHARGED WITH DUTY. From Foreign Countries.	CHARGED WITH DUTY. From British Possessions.	CHARGED WITH DUTY. Total.	REMAINING IN WAREHOUSE. From Foreign Countries.	REMAINING IN WAREHOUSE. From British Possessions.
June 5, 1844.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, .	246,357 4	3 6	246,361 2	63,319 4	. .	63,319 4	411,380 6	119 5
Barley, .	205,764 3	. .	205,764 3	166,692 6	. .	166,692 6	49,523 4	. .
Oats, . .	10,273 6	. .	10,273 6	6,871 5	90 6	6,962 3	56,649 5	. .
Rye, . . .	7,346 5	. .	7,346 5	1,927 3	. .	1,927 3	6,765 3	. .
Pease, .	13,224 7	. .	13,224 7	3,071 2	. .	3,071 2	34,774 7	. .
Beans, .	10,393 2	. .	10,393 2	3,994 1	. .	3,994 1	69,445 2	. .
Totals,	493,360 3	3 6	493,364 1	245,876 5	90 6	245,967 3	628,440 3	119 5
July 5, 1844.								
Wheat, .	221,762 3	3,032 4	224,794 7	77,946 6	3,032 4	80,979 2	549,103 4	119 5
Barley, .	33,258 5	. .	33,258 5	3,229 4	. .	3,229 4	72,839 6	. .
Oats, . .	29,150 6	. .	29,150 6	23,576 2	. .	23,576 2	60,236 7	. .
Rye, . .	253 7	. .	253 7	228 3	. .	228 3	6,790 3	. .
Pease, . .	10,840 2	1,031 5	11,901 7	1,567 5	701 6	2,269 3	40,252 2	380 4
Beans, . .	13,976 3	. .	13,976 3	4,980 3	. .	4,980 3	76,857 5	. .
Totals,	309,242 2	4,034 1	313,335 3	111,528 7	3,734 2	115,263 1	805,332 3	499 1
Aug. 5, 1844.								
Wheat, .	166,858 4	14,331 3	181,189 7	357,586 4	14,331 3	371,917 7	351,430 4	119 5
Barley, .	61,461 3	1,406 5	62,868 0	23,464 2	1,436 5	24,900 7	108,416 6	. .
Oats, . .	61,833 2	267 7	62,101 1	46,840 6	267 7	47,108 5	72,399 2	. .
Rye, . .	2,230 5	. .	2,230 5	1,497 6	. .	1,479 6	7,862 1	. .
Pease, .	4,833 7	4,405 4	9,239 3	3,697 3	4,765 6	8,463 1	48,814 7	. .
Beans, .	33,340 6	. .	33,310 6	28,268 2	. .	28,268 2	79,452 3	. .
Totals,	330,558 3	20,411 3	350,969 6	461,354 7	20,801 5	482,156 4	668,375 7	119 5
June 5, 1844	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, .	42,123 1 17	1,091 2 5	43,214 3 22	657 16	1,678 2 21	2,336 2 9	191,965 2 11	4,106 1 [illegible]
Oatmeal,	374 2 15	. .	374 2 15	. .	. .	. .	35 3 17	31 2 [illegible]
Totals,	42,498 0 4	1,091 2 5	43,589 2 9	657 3 16	1,678 2 21	2,336 2 9	192,001 1 0	4,138 0 [illegible]
July 5, 1844.								
Flour, . .	3,768 2 16	25,660 1 11	29,428 3 27	675 2 24	27,119 3 18	27,795 2 14	189,457 3 8	2,647 1 [illegible]
Oatmeal,	. .	8 2 10	8 2 10	. .	21 2 11	21 2 11	35 1 24	38 2 21
Totals,	3,768 2 16	25,668 3 21	29,437 2 9	675 2 24	27,141 2 1	27,817 0 25	189,493 1 4	2,686 0 9
Aug. 5, 1844.								
Flour, . .	39,669 2 4	209,845 1 16	249,514 3 20	5,098 3 12	209,783 2 4	214,882 1 16	212,867 3 12	2,709 1 [illegible]
Oatmeal,	22 3 8	91 2 11	114 1 19	. .	91 3 11	91 3 11	7 2 25	33 3 11
Totals,	39,692 1 12	209,936 3 27	249,629 1 11	5,098 3 12	209,874 1 15	214,974 0 27	212,875 2 9	2,743 0 [illegible]

PRICES of BUTCHER-MEAT.

Date.	LONDON, Per Stone of 14 lb. Beef.	LONDON, Mutton.	LIVERPOOL, Per Stone of 14 lb. Beef.	LIVERPOOL, Mutton.	MORPETH, Per Stone of 14 lb. Beef.	MORPETH, Mutton.	EDINBURGH, Per Stone of 14 lb. Beef.	EDINBURGH, Mutton.	GLASGOW, Per Stone of 14 lb. Beef.
1844.									
June	5/6 to 7/9	5/9 to 7/9	5/6 to 7/3	5/6 to 7/6	5/3 to 7/6	5/3 to 7/3	5/ to 7/	5/3 to 7/0	5/3 to 7/3
July	5/9 7/9	5/6 7/6	5/3 7/3	5/3 7/3	5/3 7/3	5/3 7/	5/3 7/3	5/3 7/3	5/3 7/3
Aug.	5/9 7/9	5/6 7/9	5/3 7/	5/3 7/	5/ 7/	5/3 7/	5/0 7/	5/ 7/	5/ 7/

PRICES of English and Scotch WOOL.

English, per 14 lb.			Scotch, per 14 lb.		
Merino,	16/6 to	22/6	Leicester Hogg,	17/ to	[illegible]
in grease,	14/	17/1	Ewe and Hogg,	14/6	[illegible]
South Down,	17/6	20/6	Cheviot, white,	13/6	[illegible]
Half Bred,	14/6	17/	Laid, washed,	9/6	[illegible]
Leicester Hogg,	17/6	22/	unwashed,	8/	[illegible]
Ewe and Hogg,	14/6	17/6	Moor, white,	7/6	[illegible]
Locks,	7/6	11/	Laid, washed,	[illegible]	[illegible]
Moor,	7/	8/6	unwashed,	[illegible]	[illegible]

GUANO, ITS HISTORY AND USES AMONG THE PERUVIANS.

(*Continued from p.* 607.)

By Mr William Walton.

Of late years it has become the fashion to apply scientific principles to even the most ordinary branches of agriculture, those which our forefathers pursued from mere habit, and without searching into the secret of causes and effects, judging of the efficacy of the system adopted merely by the comparative weight of their crops. It is, however, now agreed that there is no possibility of adopting an enlightened and economical method of cultivating the land without calling in science to our aid, as any such method must be based upon a correct acquaintance with those elements which serve to nourish plants, as well as with the true nature of soils, and the action of manures upon them. Hence recurrence is had to organic chemistry in its application to vegetable physiology and agriculture. Nothing, however, can be more simple and obvious than the theory of manures. As before stated, like corporeal beings, plants stand in need of a constant supply of food. In this respect they resemble animals so nearly in their wants and functions, that almost the same mode of treatment suits them; and hence, if we wish to augment the produce of any grain or vegetable consigned to the earth, it must be ascertained, either by the aid of chemistry or practice, which is the most suitable nourishment for each, and then in what manner that nourishment is best administered.

The thirst for information on this useful and interesting topic has now become so great and so general, that writers of eminence, both here and on the Continent, are constantly employed in researches upon it, the results of whose labours, either in periodicals or detached works, are already extensively circulated among farmers. Science, as applied to agriculture, one would almost think, has been pushed to its extreme limit, in order to ascertain the principles on which plants are nourished, together with the effects of soils and manures upon their growth; but the illustrations adduced, in support of even the best theory on this subject put forth, have been almost exclusively derived from European practice, and bear a modern date. In the old works which we have been accustomed to read, as before remarked, we admired the plan of cultivation pursued by the Peruvians, and felt astonishment at the stupendous structure of the works erected by them in order to aid that plan by the distribution of water; but the manner in which they manured their lands, and the results thereby obtained, seem, in great measure, to have been overlooked, although, at the same time, we could not pay a higher

compliment to the intelligence of those plodding mountaineers than by sending to their shores, as after so long a lapse of time we are doing, for large supplies of that very compost which served to multiply their crops. Certainly we might have learnt some useful lessons from their experience. The remaining pages of this paper will therefore be devoted to a description of the process observed by the Peruvians in the application of guano as a fertilizer, founded upon the testimony of the early annalists, which it is proposed to illustrate by the authorities of those modern writers of credit who have had an opportunity of witnessing that process on the spot.

Acosta is the earliest historian who noticed the method adopted in Peru for manuring land at the time when the Spaniards arrived there. Speaking of the birds frequenting the coast, and of the ordure left by them, he remarks thus—

> In some of the islands contiguous to the coast, the ridges along the cliffs and hills are so perfectly white, that one would almost imagine they were topped with snow. The whole of this covering is an uninterrupted heap of the excrement of sea-fowls accustomed to brood there, and so great is the accumulation, that it is often some yards deep. To these islands vessels go solely for the purpose of loading this dung—for nothing else is to be had there; and so great is its efficacy, that the land manured with it produces a much larger crop of grain, and also an increased quantity of fruit. This dung is called guano, from which Lunaguano, in the Peruvian valleys, takes its name, it being there that it is more generally used. Quinces, pomegranates, and other fruits, on that spot, exceed those met with elsewhere, both in size, flavour, and beauty, peculiarities attributable to the circumstance of the trees receiving moisture from water which has passed through lands served with guano.*

In his Commentaries, book v. chap. iii., Garcilasso de la Vega has the following passage:—

> On the sea coast, from the other side of Arequipa as far as Tarapaca, a distance equal to 200 leagues, the inhabitants use no other manure than the dung of marine birds, large and small, which abound on the whole Peruvian coast, moving about in immense flocks; and, at a distance, the heaps of droppings left by them appear like so many points upon the snowy ridge of a hill. In the time of the Incas, the precautions observed for the preservation of these birds were so great, that, during breeding-time, no one could land upon the islands which served them as a resort without incurring the penalty of death, an enactment intended to prevent them from being disturbed and driven from their nests. At no time of the year was it lawful to kill them; and in cases of infraction the same penalty was awarded. Each island was destined for the supply of a particular province, but, if large, was allotted to two or more. The guano deposits were then apportioned off, and boundaries fixed to each division, in order that persons of one province or district might not trespass upon the jurisdiction of another. A sub-division, under proper authorities, was then made for each town, when the dung was distributed in allotments proportioned to the number of residents requiring it. The native of one town could not take the manure belonging to another; if he did, it was declared a theft, and as such punished—nor could he carry away more than had been assigned to him.

In the valley of Cusco, and the *servania* or uplands, Garci-

* "Historia Natural y Moral de las Indias."—Lib. iv. cap. 37. Ed. 1591.

lasso further notices that, in his time,* the farmers prepared their maize fields with what we call night-soil; and in the cold and more elevated regions, where that grain will not grow, for their edible roots they used cattle-dung—meaning the droppings of European cattle, which by that time had become pretty general in Peru, and not those of the llama and alpaca, by the Indians converted into fuel. When the wind blows strongly from the sea, the rising tide on the Peruvian coast brings with it immense shoals of pilchards, which, being unable to recede when the ebb comes on, are left scattered in immense numbers on the beach. In the neighbourhood of Arequipa and Arica, where it seldom rains, Garcilasso adds that the natives manured with these pilchards by putting two maize seeds into the head of one of them, which they then buried in a hole made with a dibble.

At the period the Spaniards arrived, they saw none of the European vegetables, grain, or flowers, among the Peruvians. There were no turnips, lettuces, cabbages, asparagus, or spinach; no wheat, rice, pease, or beans; no roses, pinks, or jessamines; but still for all they were amply provided with equivalents. In very few years most of the imported vegetables—grain and pulse—however, became general throughout the country, where they grew with such astonishing rapidity and luxuriance, that Garcilasso says, before he took his departure for Spain, several vegetables, among which he mentions turnips, were almost considered weeds, and as such rooted up, and that spinach grew to an enormous height. From the same authority we learn that the first wheat seen in Peru was brought over by a lady of rank, named Maria d'Escobar, a native of Truxillo in Spain, a blessing for which, he goes on to say, she ought to have been deified, as Ceres was among the ancients. The quantity first landed did not exceed a couple of quarts, and so much was this seasonable supply at the time valued, that no more than from twenty-five to thirty grains were distributed to each landed proprietor, who, among so many competitors, had interest enough to obtain a preference; and, in order to husband the seed, each fortunate possessor held himself bound not to use his forthcoming crop for bread, or any other purpose, till after the third year.

Garcilasso remarks that he had no note of the precise year in which this valuable importation occurred; but, from his own knowledge, he took upon himself to affirm that up to 1547 no wheaten bread had been sold in Cusco. Soon after that period, and when the experiment had been fully carried out, he then

* He was born in Cusco. His father was an officer employed in the conquest, who married a descendant of the Incas. The son came over to Spain in 1560, when he published the work quoted.

gives us to understand that the seed-lands and climate in the best valleys proved to be so extremely favourable for the growth of wheat, that it there yielded 300 *fanegas*, or bushels, for 1. The same historian relates an anecdote highly illustrative of the fact which he had just before confidently asserted. In the year 1560, while travelling down to the coast with the view of embarking for Spain, he tells us that he passed through the valley of Huarcu, where he was invited to supper by a neighbouring farmer. During the meal his host pointedly drew his attention to the wheaten bread upon the table, inviting him to taste and notice it in a particular manner, as he would have it in his power to tell them something marvellous when he reached the mother country; for the grower assured his guest that the bread before him was made of wheat sown by himself, and that for 2½ bushels he had received back 680.

In several of the lower parts of Peru it, however, appears that, about a century and a-half afterwards, the growing of wheat materially declined, a circumstance attributed to an occurrence of the most fearful kind, which deserves some notice in this place. D. Miguel Feyjoo, a resident clergyman of the highest character, and much quoted by the Peruvians, in 1761* wrote a "Descriptive Account of the City and Province of Truxillo," situated upon the coast to the northwest of Lima. In this work, speaking of the great change which had taken place, he remarks that, since 1687, the lands in the vicinity of Lima had lost their fertility as regarded wheaten crops, in consequence of the great earthquake which happened there on the 20th of October in that year. In the Peruvian capital this awful visitation, it is well known, caused the destruction of numerous edifices, attended with great loss of life; but Feyjoo assures us that in Truxillo, where he wrote, it was only perceived by a rumbling noise, and without any shock being felt. Nevertheless, he proceeds to say, "the falling off in the wheat crops was equally noticed there, in places where the fecundity of the soil previously had been so great that this grain yielded as much as 200 for 1," quoting as an example the valley of Chicama, which, at one time, annually produced 160,000 bushels. This failure Feyjoo attributes to some malignant influence in the atmosphere, which extended to a considerable distance along the coast, and by the farmers called "the epidemic among the wheat." So durable were the effects, that, for thirty years afterwards, the same author declares it was not even possible to obtain back the seed sown; for although the ear grew no grain formed in it: but, adds he, "the lost vir-

* Two years afterwards this work was published in Madrid.

tue of the soil is now (1761) gradually returning, as is the case in the valley of Lima, where 25 bushels may at length be obtained for 1."

For this unexampled phenomenon, the truth of which is attested by other parties,* as well as by government archives, it would be impossible to account. The Peruvian writers, however, agree in stating that the consequences were confined to wheat, and that vegetables and the indigenous grain were not affected, a circumstance which renders this occurrence the more extraordinary. We are not told what artificial means were resorted to in order to remedy a defect which spread consternation among the inhabitants of those districts hitherto accustomed to grow wheat. To a preparation of the seed, either by steeping or any other process, it is well known that the Peruvians have an insuperable objection, considering that premature germination cannot fail to prove injurious.

From the deposits being so near, it is, however, only reasonable to suppose that guano was tried as a restorative. That it did not produce the effect desired is only another proof that the cause of the calamity was in the air, although it must, at the same time, be allowed that there is some difficulty in introducing this kind of manure equally into the ground with seed. The great object of the Peruvians being to manure the plant rather than the soil, they abstained as much as they could from indiscriminately scattering their guano on the surface, or in any other way using it as a top-dressing; because practice had taught them that a substance so volatile easily evaporates, and consequently loses most of its essential properties when exposed to the action of the air. On this account it is not considered so serviceable for wheat and barley as for other grain, pulse, and vegetables. It is, at the same time, incontestibly proved that, with the aid of guano, the ancient Peruvians were enabled to cultivate the same lands, and render them permanently productive, for the same crops of maize and millet. To their terraced seed-lands no repose was given, neither was there any alternation of crops, a proof that guano affords a more durable fertility than any other kind of

* In 1806, Dr Hipolito Unanue, a Peruvian, and one of the principal contributors to the *Mercurio Peruano*, published his "Observations on the Climate of Lima," chiefly derived from his own experience as a physician, in which work his meteorological tables are much esteemed. Speaking of earthquakes, he remarks thus—"Frequently vegetation suffers much from these awful visitations. The earthquake of 1687, as regards wheat, caused our fields to become barren. The stem grew in an apparently healthy condition until the ear made its appearance, when the grain, eaten away by smut, crumbled into a black dust, and the crops were lost. Twenty years afterwards our fields began to recover their former fertility, but the blow thus received by our agriculture, as far as wheat was concerned, proved mortal." This estimable work was reprinted at Madrid in 1815.

manure. In the province of Arequipa it is an established fact that where guano is applied maize yields 35 and potatoes 45 for 1; whereas, in the same districts, wheat manured with horse-dung does not go beyond 18.

Much, however, must depend upon the manner in which birds' droppings are used. The earliest foreign writer who described the process of cultivating the *axi*, or Guinea pepper, in the southern districts of Peru, was Frezier, who, in 1712, 1713, and 1714, performed an exploring voyage to the South Sea. Passing down the upper coast of Peru, he noticed that the island of Iquique was inhabited by Indians and blacks, exclusively employed in procuring guano, which they shipped off for the vineyards and seed-lands of Tarapaca, Pica, and the neighbouring districts on the mainland. Speaking of the valley of Arica, he says that there

> The produce of *axi* is considerable,* far beyond what could be expected from the size of the plant, and that this prodigious result is obtained with guano, or the ordure of birds brought from Iquique, which fertilizes the land in such a manner that it yields 400 and 500 for 1, in all sorts of grain, wheat, and maize, and more particularly *axi*, when people know how to manage it in a proper manner. The seeds having come up, and the plants being in a fit state for setting, (he proceeds to say,) they are laid down on slanting ground, in order that the trenches, which bring on the water destined for irrigation, may convey it gently to each stem. As much guano is then put to each plant as will rest on the palm of the hand; when the flower is formed, they add a little more; and, finally, as the pod appears, a good handful is thrown in; but, as it never rains in that part of the country, great care is always taken to have the plants watered, experience having proved that, without this precaution, the salts in the manure, not being diluted, would be apt to burn them. For this reason the guano is applied at intervals, and with great care, the necessity of which has been taught by practice, and by noticing the difference observable in the crops obtained.

Feuillée, (*Journal des Observations Physiques*, &c.,) who, in 1714, visited the western shores of South America for scientific purposes, thus describes the port and neighbourhood of Arica:—

> The harbour is sheltered from the south winds by a large projecting rock† and a small island, both of which serve as resorts to an infinite number of birds, which every evening come hither to roost, and in the morning go forth to seek a livelihood. Their ordure, which the country people call guano, is one of the best revenues of the town. On the sea-side storehouses have been built, to which this article is brought, and there deposited, for the purpose of loading vessels carrying on no other traffic than this, and which convey it to various parts of the neighbouring coast, where it is used to manure the land. The insupportable smell of the ordure of this immense number of birds, which pass the night on the broad and lofty crag above mentioned, greatly contribute to the sickness experienced in the town; and hence the inhabitants are generally in an unhealthy state, have a yellow tinge of counte-

* *Capsicum baccatum*, red or Guinea pepper. Without this condiment the natives relish no kind of food, except that sweetened with sugar. The Indians eat it with salt, and it is an essential ingredient in their stews. So great and general is the demand for it among the Peruvians, that the value of this article, annually grown in the jurisdiction of Arica alone, exceeds 600,000 dollars.

† This promontory is called *El Morro*.

nance, and live in a state of languor. Foreigners, unaccustomed to this bad smell, are afflicted with unusual headaches, which obliged the people of our crew to return on board every night, fearful of falling ill.* The inhabitants might easily guard against the consequences of the effluvia complained of, by firing upon the birds, but they prefer sacrificing their health to sordid gain, which their constant infirmities, however, prevent them from enjoying.

Ulloa, in his Voyages, part ii., book i., has the subjoined passage:—

In the jurisdiction of Chancay, as well as in other parts of the Peruvian coast, they infuse warmth into the land with the dung of certain sea-fowls, extremely abundant along the shore, called *guanaes*, and their dung guano, a general term among the Indians, and signifying excrement in general. These birds, after they have been out all day fishing on the sea, go to roost on the small islands contiguous to the coast, and as their number is so great that they actually cover the ground, the droppings left by them are in the same proportion. With the heat of the sun these deposits are formed into a kind of crust, which is daily increased, and as the quantity collected is so extremely great, it does not become exhausted, notwithstanding they are constantly carrying it away, because in a short time the depôts are regularly replenished. I have been on some of these islands when they were loading vessels, and the bad smell emitted was so offensive that it became insupportable. There could be no doubt of what the article was. This dung is used on the lands sown with maize, and by their being served with it the crops are considerably increased. A small quantity is put round each plant, which is afterwards watered.

In another part he says that this kind of manure is good for all other seed-lands, "with the exception of those destined for wheat and barley."

The highest authority, however, on this, and indeed on any other scientific or statistical subject connected with Peru, is that of the distinguished naturalist M. Alcide d'Orbigny, who, in 1826, was sent by the Directors of the Paris Museum to explore the upper division and western coast of South America, where he remained till 1833, having spent the greater part of his time in Peru. The result of his valuable researches has, for the last ten years, been publishing at Paris in a voluminous and splendid work, filled with beautiful illustrations, under the title of "Voyage dans l'Amerique Meridionale;" and, describing his voyage along the Bolivian coast, he introduces the following passage:—

Approaching the coast, a little before I arrived at Cobija, I noticed that all the rocky points sufficiently high not to be exposed to the inroads of the sea were tinged with white, a colour which the tops of the headlands along the coast equally bore. This phenomenon struck me very forcibly, and in vain did I recur to geology for that explanation which zoology afterwards afforded to me. This white substance, frequently seen in layers of considerable thickness, in fact proved to be nothing else than the ordure of birds, known in the country by the name of guano, and, as a manure, constituting one of the principal branches of the commerce carried on along this part of the coast. It would be difficult to explain the nature of accumulations so considerable as these, by the ordinary quantity of birds which we are in the habit

* Humboldt noticed that the smell, to those persons who were not accustomed to it, had the effect of causing them to sneeze violently.

of seeing upon our own shores; but in America this is not the case. There the great number of uninhabited points enables the feathered tribes to roost and nestle in peace, at the same time that this sea, in a virgin state as regards fishing, and, perhaps, abounding in the finny race more than any other in the world, furnishes them with the easy means of obtaining a subsistence. Hence it follows that these animals are there so numerous that, at certain seasons, their various tribes actually darken the air as the flocks move along. All these marine birds, in consequence of their invariably reposing in large societies on the same points, and there passing the night, unceasingly augment the strata of guano; and as it does not rain in that part of the country, the surface is never washed by those heavy showers to which we are accustomed in Europe. These masses, therefore, cannot be removed unless it is with the aid of man.

In a note appended to the preceding passage, M. d'Orbigny remarks that the flocks alluded to were chiefly composed of the gull, gannet, pelican, cormorant, and phaeton families. Proceeding further down, our enterprising traveller saw shoals of fishes passing near his vessel, some of which threw themselves one and two metres high out of the water, and then fell down into it again. They proved to be dolphins. He passed opposite to the island of Iquique, which he says formerly was frequented only by *guaneros*, or guano vessels, employed in conveying to the neighbouring mainland bird-droppings, there considered an excellent manure. With this article, he then remarks, the inhabitants have been accustomed to provide themselves for upwards of three centuries, on a small island, situated to the north of point Itique, and not more than a league in circumference. Here he was assured that an adequate supply exists for a considerable time to come, adding that the village on the island is now rendered more remarkable by the shipment of nitrate of soda. After these preliminary details, the same writer gives the following graphic description of the appearance of the coast in the front of Arica:—

Ascending the *Morro*, or huge rocky crag at the entrance of the harbour, to an elevation of 240 metres above the level of the sea, the whole bay lay stretched before me, presenting a truly novel sight. The removal of a series of beings from one place to another always brings with it others following in their train. In Europe I had witnessed the great hibernal migrations of ducks, carrying with them other birds towards the southern regions, and also shoals of pilchards accompanied by gulls. In America I had seen the pigeons of Patagonia cause the eagles of the surrounding country to assemble, but nothing in the world could be compared to what now presented itself to my view. On the shore, even close to Arica, children and women were busied in the water with baskets and bowls, catching thousands of little anchovies, which they heaped high up on the strand, or threw down upon the beach, when each wave carried them forward in rows. This fry they emulously disputed with myriads of sea-swallows (*Sterna-Inca*) eager to feed upon it, and which, every minute, darting down, reappeared with the poor little fish in their bill.

While this scene was passing inshore, another not less noisy fishery was going on at a distance out at sea, where, no doubt, a similar shoal, or one of another kind, had been discovered. Clouds of birds obscured the spot, eagerly clinging to it. Over the surface black gulls skimmed the air, and alternately dived. A little further on flocks of gannets and cormorants, mixed with enormous pelicans, carried on other gambols. Nothing could be more curious than to see these winged phalanxes, some hovering seven or eight metres above the sea, while others, folding up their wings, let themselves fall almost perpendicularly, and with the head foremost, upon the

fish which they pursued swimming, causing the water to splash up around them. With difficulty they emerge, holding their prey in the bill, and some minutes afterwards make another plunge. One would almost imagine that they were engaged in some extremely animated game, enlivened by a thousand screams, although merely availing themselves of an annual migration in order to secure a meal.

For a long time I kept my eyes stedfastly fixed upon this amusing fishery, when at length the parties engaged in it, having satisfied their appetites, separated in families, and winged their way to various points along the coast. The grave pelicans—the giants of the party—sought repose on the rocks projecting into the sea, where, soon becoming immoveable, their neck upright and the bill lodged on the breast, with a stupid and almost ridiculous appearance, they quietly awaited the progress of digestion. Among the other species, the gannets and cormorants imitated their example, actually coming and placing themselves immediately below the spot upon which I stood, at all elevations upon the projecting crags of the *Morro*, which they daily blanched with their droppings, while the flocks of gulls, still more numerous, took a southern direction, in order to seek out some rock, the possession of which would not be disputed with them by any of the stronger inhabitants of the air. These performances regularly took place every morning and evening. At first we see these birds separately skimming the vast extent of the ocean, in order to seek out the shoals of fishes as they move along. Suddenly one of them stops, hovers for a few moments, and then plunges. If the same bird successively goes through the same evolutions twice, the attention of the other explorers becomes attracted, and, ere long, they are seen assembled on the same spot, when the general fishery commences. It is these innumerable flocks of birds which, as I have already stated, deposit the thick layers of guano, fetched away from these islands as a manure indispensably necessary to the fertility of the Peruvian soil.

So far M. d'Orbigny.

In these formations it is, however, an established fact that, at a certain season of the year, the sea-birds are materially assisted by other allied families from the interior. Upper Peru, it will be recollected, is studded with lakes, some of them of an enormous size, but they afford very little fish; indeed the quantity is so small that it does not reward the labour of the few persons employed in catching it. These inland sheets of water, often situated in the most secluded regions, are, nevertheless, frequented by an immense number of aquatic birds of various kinds, which, in the winter, when the surface for several months is frozen over, no longer finding subsistence in their usual haunts, as the cold weather comes on, annually migrate to the coast, there to share with their kindred species the produce of the deep. At Arica, and along the upper part of the coast, for days together they are seen descending in family flocks along various lines, and, as the mild season approaches, return in the same order.

Speaking on this part of the subject, Dr Unanue makes these remarks—

The shores of the South Sea are covered with birds, among which, on account of their incalculable number, are distinguished the *huanaes*, from whose dung comes that red earth, with a pungent and alkaline smell, used as manure on the lands, in order to increase the produce three and four hundred fold—a discovery made by the ancient Indians, who were consummate masters in agriculture. Among these birds, many gulls, herons, ducks, and other aquatics, in autumn, come down from the lakes in the Sierra to the coast, where they remain till the summer sets in, when they

return. In order to undertake this journey they assemble early in the morning in large parties, and as they soon come to the high ridges of the mountains, which prevent them from proceeding forwards, to surmount this barrier they are seen ascending in a spiral manner, till, after numberless evolutions and gyrations, they have risen above the loftiest peaks, and thus find themselves in a situation to pursue their course in a direct line. It is not unusual to see a condor place itself at the head of the flock, either to serve as a leader or to display that superior strength which enables it to outstrip the strongest of the feathered race.*

The authorities here adduced at once set at rest those doubts which exist regarding the origin of guano, by some persons still supposed to be volcanic. It will have been seen that the accumulations of this useful article were formed by the nightly droppings of a great variety of the *raptores* tribes, or birds of prey, feeding on animal substances, accumulations which have probably been going on ever since the sea was peopled with fishes and the air with the feathered race. Among those birds more particularly distinguished are the *palmipedes*, or web-footed tribes, including pelicans, cormorants, frigate-birds, gannets,† ducks, darters, and tropical birds of the phaeton genus. The *longipennæ*, which may be called the vultures of the sea, and among them the family of the petrels, the albatross, (the largest and most powerful of the feathered wanderers of the ocean,) gulls, terns, and skimmers; the piscivorous species of the *anatiæ*, or swans and geese, and the family of the *brachypteræ*, or divers, pursuing their prey under the surface. To these may be added the order of *grallatores*, waders, or shore birds, whose habits are littoral, great varieties of which are accustomed to congregate on the margins of the upland lakes, and, as already noticed, in the autumn come down to the coast. Among these the curlew, plover, and crane, are the most remarkable. All these various tribes of aquatic birds, together with others in the habit of feeding on small fry, *crustacea* and *molusca*, are the producers of guano, and their numbers can only be estimated by millions.

Guano, consequently, is not the accumulated droppings of one particular bird bearing that name, but the aggregate leavings of a variety. The etymology and meaning of the word have not, indeed, been properly understood. In the Quichuan, or prevailing Indian language of Peru, *huanu* means dung, *huanucaci* to dung lands, and *huanacs* dung birds. The Peruvians have no *g* in their alphabet, and the first syllable in the three words above

* The flight of this bird, which, it is well known, dwells upon the highest summits of the Andes, was observed for many years by a Peruvian resident named Santiago Cardenas, usually called *El Volador*, (The Flyer,) with the design of inventing a pair of wings to imitate it. When he died he left behind him a work, written by himself, upon this subject, in which he states that the condor regularly comes down to the coast twice a day in quest of food. This work is deposited in the library belonging to the college of San Fernando.

† Of these the most numerous is the *Sula candida*, or booby.

inserted as an example, they pronounce broadly *wha*, as a Scotchman would; but as the Spaniards have no analogous sound in their language, they adopted the guttural one which they give to *g*, and their spelling and pronunciation have now prevailed everywhere, except among the Peruvian Indians.

As M. d'Orbigny very justly remarks, no one who has not visited the upper coast of Peru, and witnessed the scenes which there present themselves over an immense surface, can have any idea how these large accumulations have been formed, and yet the composition of these masses cannot now be half so rapid as it was before so many traders frequented the Pacific. Of late years the guano birds have been much disturbed by increased traffic, as well as by their being wantonly fired at. During the War of Independence, armed vessels scoured the coast, and near it several engagements took place. At this period twice was Arica besieged, so that, what with cannonades, more frequent intercourse, the unseasonable periods at which the depôts have been assailed, and the unrestricted manner in which their contents were carried away, it may be easily imagined that a large proportion of the contributors have forsaken their old haunts and sought out fresh ones; but, as the total number does not decrease through the persecutions of man, and procreation continues in the same ratio as heretofore, the same natural agency must be at work elsewhere. Other deposits it may, therefore, be safely concluded are forming on more secluded spots, probably in the Northern Pacific, whence, in all likelihood, the United States will, in the course of time, receive supplies overland by those new routes which they are endeavouring to open. By this means they would be able to counteract the injurious effects of that system of overworking which, for an uninterrupted course of years, has been going on in the greater part of their corn lands.

It would be almost an idle task to attempt any estimate of the nightly droppings of the countless flocks of birds still unceasingly *contributing to the guano formations*. The *palmipedes* tribes, such as the pelican, cormorant, and gannet, no doubt are the largest producers, owing to their size and the quantity of food which they devour. Supposing, then, that there might be one million of each of these kinds of birds constantly at work, (and I am assured by creditable witnesses that this number would not be over-rated,*) and that each bird voids one ounce weight in

* It was estimated by the traders on the south-west coast of Africa that, in 1828, there was half-a-million carcasses of seals lying on Possession Island, and fully as many more on Seal and Penguin Islands, within Angra Pequena Bay, which must either have fallen victims to some direful pestilence, or been destroyed by one of those awful visitations called sand-blasts.

the course of the night, the aggregate quantity, in that case, would exceed 90 tons in the twenty-four hours, or 32,850 tons in the year, to which are to be added the leavings of numerous other tribes. It is, however, to be borne in mind that in the formation of these deposits there is some sub-division, as the birds of one species do not all roost upon the same spot, although they abstain from mixing with other tribes; and there is, besides, great waste, more especially during the high tides and boisterous weather, as well as from another cause which will be hereafter noticed.

Still the perennial accumulations along the Peruvian coast must have been very considerable, although, with all their industry and perseverance, it cannot be supposed that, comparatively speaking, the consumption of guano by the ancient inhabitants was great, for this simple reason, they had no suitable vessels to go in search of a supply. When discovered by the Spaniards, their navigation was confined to *balsas* and canoes, with which they could only ply along the coasts, and visit the insulated rocks at a short distance out at sea. On the headlands, and other points within their reach, they, however, collected a sufficiency to meet their wants, and, when obtained, great economy was observed in its application; but there must have been many deposits, most probably of the largest kind, never touched by them. From the accounts handed down to us, it would also seem that they laid in their provision only at one particular season of the year, so there is reason to conclude that then they collected no other than fresh droppings. They had no idea of digging for guano with a pickaxe. They used it in its freshest and purest state, regularly taking away the accumulation of each year from such haunts as were accessible to them. The portion left was rejected, or at least not considered available.

With the very rapid decline in the aboriginal population subsequent to the conquest of Peru, the annual total consumption of guano by the modern mixed inhabitants must have been much reduced; indeed, from all the inquiries which I have been able to institute upon the spot, I am inclined to believe that, at the commencement of the present century, when the fairest criterion may be formed, it did not exceed 5,000 *fanegas*, chiefly applied to the production of peppers, vegetables, grapes, maize, millet, lucerne, edible roots, sugar, cotton, flowers, &c., along the coast. The quantity above stated, calculating the heaped-up *fanega* to weigh 50 lbs., would not go much beyond 125 tons—a very small supply in proportion to the magnitude of the formations. The white guano, as being fresher and purer, has always been most esteemed, and usually sold for nearly double the price of the red and dark grey, which, in former times, might readily have been

had at the rate of half a dollar per cwt. to the shipper, although, in war-time, there were instances of its fetching more than double that price.

This decline in the local consumption of this useful commodity may be attributed to other causes besides a diminution in the number of inhabitants.* The pursuits of the present generation were directed to other objects. Mining became more fashionable than agriculture, in consequence of which the few remaining llamas, once engaged in carrying guano up into the country, were almost exclusively employed in bringing down ores from the mountains. The breeding of European cattle also absorbed a large proportion of the disposable capital. Till Europeans, principally British, brought it into request, the value of guano in the Peruvian depôts was consequently little more than nominal; but the instant it was found worth shipping round Cape Horn, and that vessels emulously sought it as a return cargo, the price naturally arose.

No sooner was the value of this neglected source of revenue made known than the Peruvian government, as lord of the soil, took the whole existing stock into their own hands, and at once established a monopoly. The first contract of any note made with them for a supply was by several united British houses, whose representative stipulated for a four year's exclusive privilege to export guano from the islands where it was known to exist, or such places where hereafter it might be discovered, at the rate of 20,000 tons per annum, in all 80,000 tons, or more if the consumption of Europe required it, at the rate of thirty dollars per ton, half payable in money, and the other half in public securities, the shipment for the present being confined to the Isla del Norte and the little islands of Chincha.

Although several parcels of this article had, by interested parties, been brought over for trial, its utility, as a new fertilizer, was not formally introduced to the notice of the public, from any high authority at least, till 1841, when Lord Stanley mentioned it at the dinner meeting of the Royal English Agricultural Society, held at Liverpool in July in that year. Soon afterwards cargoes began to arrive, and, in October, agents in Liverpool and London, by long and explanatory circulars, recommended its adoption among our agriculturists. The first cargoes landed sold from 22s. to 28s. per cwt.; in 1842, it fell to from 14s. to 15s.; and in 1843, to from 9s. to 10s. It is estimated that, at the close of last year, about 29,000 tons had arrived from Peru, a large propor-

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* After supplying their own wants, at one time, the Peruvians exported wheat and other grain to Guayaquil, Panama, and even Chile. This traffic ceased some years ago.

tion of which cost £6 freight per ton, independent of the government charge, equal to £6 : 15s. more. From the same quarter some shipments also went to France. All the quantity brought to our shores was not, however, consumed in the country. Some parcels went to Jamaica for experiments, no doubt; and it is rather a singular circumstance that guano, conveyed hither round Cape Horn, and purchased at £12 per ton, should have been received in a West India island, after a circuitous five or six months' voyage, and with a charge of £3 per ton freight, when, if proper arrangements had only been made, precisely the same article might, in a fortnight, have been received direct across the Isthmus of Panama, at one-third of the charge; for it is known to exist as low down the Pacific coast as in front of Guayaquil.

In collecting, on limited localities, the quantity of Peruvian guano brought within the last three years to Europe, and which, up to the present period, by competent judges, is estimated at no less than 30,000 tons, a considerable surface of ground must have been uncovered; and there is every reason to believe that, in many instances, a quantity of impure or heterogeneous substances entered into the general mass. The contributors to the guano stocks invariably roost upon the most elevated points which they can select, when they have room on the face of the rocks, or the tops of projecting crags; and although it has been stated by M. d'Orbigny, as well as by other highly respectable travellers, that it never rains along the upper part of the Peruvian coast, this assertion must not be taken in too strict a sense. With a powerful sun, blazing almost vertically, it will readily be imagined that the evaporation from the wide and smooth expanse of the Pacific, as well as from the luxuriant valleys bordering upon one side of it, must be enormous, and the collection of vapours in the upper regions of the atmosphere consequently in the same proportions which, when they have attained a specific gravity, necessarily must descend.

That it seldom rains in the maritime valleys, while on the mountains, only ten and twelve leagues distant, torrents frequently fall, is a fact on all hands acknowledged, and the causes of this phenomenon have been made the especial study of several distinguished naturalists. Among these, Dr Unanue unquestionably had the best opportunity of observing, for a series of years, the peculiarities remarkable in the climate of his native land, and in his interesting little work, above quoted, he accounts for the singularity alluded to in this manner. The atmosphere round Lima, (and this is a fair specimen of the upper coast,) he tells us is opaque, nebulous, and little renovated, and this part of the country being surrounded by lofty mountains to the north,

the gentle winds, prevailing from the west in the morning and the south in the evening, bring the vapours from the offing over the longitudinal valleys, where they frequently rest in mid-air, like a kind of awning. Then it is that the *garua*, a copious dew, falls; but if the winds are more than usually powerful the vapours are carried rapidly onwards towards the mountains, where, condensed by the cold, deluging rains follow.

This is the ordinary state of the atmosphere along the Peruvian shore throughout the year; but exceptions are occasionally noticed. If the maritime evaporations have been unusually great, and the accumulations in the air are too dense and too heavy to be wafted across, sudden showers descend along the coast, as well as on the contiguous islands. Of these accidental changes in the weather some remarkable instances are recorded. Dr Unanue, alluding to this subject, speaks thus:—"In summer it sometimes happens that it rains at five in the afternoon, but then it is a heavy rain, and lasts only for a short time. In the years 1701, 1720, 1728, and 1791, it however rained so copiously along the coast and in the valleys during the summer nights, that many serious injuries were experienced." The guano-yielding islands and promontories of Peru are not, therefore, so exclusively situated in rainless latitudes as is generally believed.

There can be no gainsaying the authority here adduced upon this point; indeed, from my own inquiries among competent persons, natives as well as foreigners, I do not hesitate to say that it is fully borne out. When the peculiar locality, as well as the abundant exhalations from the neighbouring ocean are considered, heavy discharges from clouds, which are not always under the control of the winds, will be thought a natural consequence, although, owing to the seclusion of the situations, these occurrences have not been so carefully noticed as elsewhere. I therefore feel convinced that the guano formations along the Peruvian coast, left unsheltered on the surface, and often in a half liquid state, have frequently, if not annually, been washed down by heavy rains on one side into the sea, and on the other, along declivities, into the hollows below, to spots where the birds would never think of roosting.*

These masses, in their passage down, mixed with siliceous sand and other earthy impurities, were either out of the reach, or not considered worth the notice, of the ancient Peruvians, while the modern natives did not want them, and hence they have been gradually accumulating from the remotest period of antiquity,

* It may be almost unnecessary to state that the *cuyes*, or small country rabbits, although they burrow on the margins of these masses, can have had no share in their formation, as some persons, writing upon this subject, have said they had.

till at length in some places they have reached a depth of from twenty to sixty feet, according to the inequalities of the ground, and have become so completely indurated—in fact, mineralized—as to require the aid of the pickaxe and blasting, like a rock. Such are the principal deposits nearest the Peruvian shore left to be ransacked by modern speculators, and hence we ought not to feel astonished that, besides being weaker in quality, the last cargoes of guano brought from the same quarter contained a large proportion of impurities, which, in some instances, were attributed to the adulterations at home by dealers. The selection of the article on the spot requires the greatest care and vigilance. If the filling of the bags is done by contract, and the work left to the natives, deceptions become unavoidable. There is no judging from samples. The top of a package may be good, while that underneath is of an inferior quality.

The experiments made with this new fertilizer, when first introduced, were, however, too flattering, and the prospective demand for it so extremely encouraging, that the wits of our speculators were set to work, and about a year ago certain traders along the south-west coast of Africa, accordingly discovered excrementitious deposits on several secluded points, but more especially on the island of Ichaboe, lying in 26.25 south latitude, and 14.16 east longitude, which, owing to this circumstance, is by many persons now called Guano Island. It is a barren rock, in the shape of an egg, bare of soil, and, consequently, denuded of vegetation, about 1200 yards in circumference, and situated three miles from the main-land. The formations commence about six feet above high-water mark, and gradually rise according to the configuration of the ground. These hitherto neglected deposits are supposed to be the accumulated voidances of the seal, penguin, and gannet, known to abound on this part of the coast, more especially the penguin, a helpless bird, and seen in great numbers on the island by the first visitors. These stratified masses, like those on the coast of Peru, must have been in the progress of formation for ages, and equally liable to contingencies. Our knowledge of the spot is so very recent that the changes in the seasons have not yet been properly observed; but, from the contiguity of the sea, and natural atmospheric causes, it can scarcely be thought that rain does not fall there at some time or other in the course of the year.

The layers chiefly rest upon a rocky surface varying from six to forty feet in depth, and the quality is supposed to be stronger than that of Peruvian guano; if so, it must be owing to the climate being drier, and the original droppings having lost less of their ammoniacal properties through dilution, a problem which it would be difficult to solve. It is, however, well known that

sand squalls sometimes occur in these regions, which come on without any previous warning, and in moments when the sky is in a perfectly cloudless state. Moving pillars of sand are then blown from the desert shores to a considerable distance out at sea, and have covered a vessel's deck ten leagues off. There is, therefore, every probability that the Ichaboe formations equally contain sand, although perhaps, from the nature of the ground, they are divested of other impurities. Being the droppings of animals like those above enumerated, and in the habit of feeding upon fish, there is no reason to suppose that the essential properties are less suitable for manure than those of Peruvian guano; and the acquisition is besides free from royalty fees and other charges. Owing to the tremendous surf which breaks upon the shore and numerous reefs, added to the want of a convenient harbour, the difficulty and danger of obtaining a cargo are nevertheless great. There being no shipping-place on the island, it has been found necessary to construct stages over the rocks to the boats, along which the sailors carry the guano on their backs—a drudgery attended with so much risk that they can only perform it during four days in the week.

Still, in the midst of all these dangers and difficulties, so great has been the competition, that it is estimated that, within the six first months of the discovery of Ichaboe, no less than 100 vessels went out there, and, with the exception of a few lost on the reefs, returned or are returning loaded, bringing away about one-third of the accumulations. As this article continues to meet a ready sale, although at a diminished price, it may therefore be confidently affirmed that the character of bird-droppings, as a manure and potent fertilizer of the land, is now fully established. In order, then, that our farmers may not be disappointed in future supplies, when the stores of Ichaboe and Peru shall have become exhausted, it is to be hoped that, as British enterprise is so much on the alert, and our facilities of exploring distant coasts are so much greater than they were in former times, fresh deposits will in the interval be sought for and found out. In these idle times, this is indeed a duty which ought to enter into the instructions given by the Admiralty to their exploring vessels and cruizers on particular stations. More guano formations are known to exist on the south-west coast of Africa, as well as in the Pacific; let their capabilities be ascertained.

As a proof of the spirit with which this new trade is pursued in Liverpool, as well as of the expectations entertained of an increase, it may be noticed that a new chart of the world has recently been published there, exhibiting the certain and probable guano islands and coasts.

In the meantime our agriculturists have a fair opportunity,

now that the price of the article is reduced, of studying the most efficient and economical method of applying this new manure to the land, so as to render the greatest amount of service at the least possible cost, as well as the kinds of soil which it suits best; and in carrying out their experiments, they cannot do better than keep the practice of the Peruvians, in this respect, steadily in view. For the convenience of irrigation, those intelligent and experienced husbandmen, it will have been seen, planted their red peppers and other vegetables in drills, or in such a manner as to leave a small depression round each plant. To them the use of the plough was unknown, consequently they had to lift the soil with a wooden spade, and break the lumps with a mallet.* In every process manual labour was employed, and great care taken to remove the stones, particularly after the rainy season, when those on the surface were left bare, an operation in which children were employed; and to this day, in some places near the old seed-lands, heaps are noticed which could have had no other origin than this.

Their green crops, such as maize, millet, culinary vegetables, and esculent roots, were dibbled, and a small quantity of guano thrown into the bottom of each hole, which was sprinkled with light earth before the seeds and tubers were dropped, and then covered. As the growth of the plant developed itself, more guano was diffused, as near to the roots as possible;† but in each operation the essential requisite of watering was never omitted. The Peruvians seemed practically sensible that a plant

* In contemplating the method of tilling the land pursued in the Basque Provinces, I have often thought that, if those clever and frugal mountaineers had not borrowed ideas from the Peruvians, the two processes were very similar. On the hills, where the work cannot be performed with the plough, the field labourers in the north of Spain use an iron implement called *layas*, formed in the shape of an *h*, thus having two prongs sharp-pointed, and about two feet long, with the handle strongly made. Six labourers, men and women, usually stand in a line, at short distances, with one of these implements in each hand, when forcing them into the ground, always a little inclining towards the front, and pressing them down with each foot, as soon as all are ready, and at a given signal, they simultaneously raise a long deep and unbroken slice, which they turn over upon the preceding one, so as to answer all the purposes of deep-ploughing, another party having previously scattered the manure well in the bottom of the last trench. With these people an atom of stable dung, or night soil, is never lost. So attentive are they in this respect, that the peasant women, travelling along the road, are seen collecting the horse-droppings in their aprons, and children in their *boinas*, which, on reaching home, they carefully deposit on the general heap seen accumulating in the back of every cottage.

† In some rural districts of Italy a law exists whereby persons are prohibited from passing flocks of geese over grass-lands owned by others, not on account of the trespass or the quantity of herbage which the animals might consume, but, as the -ording states, "because they leave behind them droppings which discolour and urn up the surface." Had the complainants known the value of these emanations, and devised some mode of letting them soak into the soil, instead of remaining on he top, they never would have solicited such an enactment as this.

is endowed with life, and that, in order to grow and propagate its own species, it requires a constant supply of those elements brought within reach of its roots which are essential to fructification. From experience they had learned that the nutritive substances needed are imbibed from the soil; but, as the pores or organs in the roots of plants, through which those substances must be received, are so extremely small, this food cannot be taken in unless it is in a state of solution; and, considering that all living beings, whether plants or animals, have two remarkable stages—the one of infancy and the other of maturity—they concluded that the growth would always be in proportion to the quantity of nutriment afforded to plants during their early developement. Hence, and for the sake of economy, while the roots were only partially spread, they placed the *pabulum* as nearly within their reach as they could. As if perfectly aware of the powerful influence of the sun's light, they adopted the expedient of wide sowing and planting; and on this account were more particular in the economical distribution of their manure. By this means also they had more room to attend to the wants of each plant, and keep the ground clearer of weeds.

With the aid of guano, and acting upon these principles, on a limited surface the Peruvians were enabled to raise sufficient subsistence for a large community; and, in consequence of the slow and gradual solubility in the soil of those essential salts, contained in their national manure, when not exposed to the air, and which gave to its effects a durability possessed by no other compound, as previously stated, they permanently cultivated the same lands without any variation of crops. Potatoes, maize, and millet, constituted the principal food of the Andes tribes, and these they raised in the greatest perfection. Europe is, in fact, indebted to them for the possession of these three valuable articles of food.* To nearly one half of the population, concentrated upon the slopes, the potato was the staff of life; and perishable as this root is in a hot and damp climate, as before noticed, they had ingenuity enough to discover the means of preserving it by freezing, whereby it became the basis of their yearly stock. With

* Maize or Indian corn was first brought over to the northern provinces of Spain, across the Isthmus of Panama, by Basques, who accompanied Pizarro to Peru, and in some of the French provinces contiguous to the Pyrenees, such as Angoulême, Limousin, and Bearne, it is still called *blé d'Espagne*, from the seed having originally been obtained from that country. In imitation of the ancients, the early Basques made large thick cakes of the flour of acorns, borne by the two species of oaks, classed by Linnæus as *quercus suber* and *quercus ilex*, which they called *Artoa*. When maize was introduced, and which it is to be borne in mind entirely superceded the use of acorns, having in their language no name for the cakes made of it, they called them by the same, literally meaning bread made from acorn-flour, considering that the nearest resemblance to it.

sandy soils they found guano agree remarkably well. As far as it is possible to judge from the records and traditions preserved, the ancient Peruvians had, in fact, become so thoroughly well acquainted with those laws which govern the distinctive principles operating in the developement and growth of plants, that, by their strict observance of rules founded upon them, they increased the productiveness of their soil in such a manner as to render its produce commensurate with their wants. They, in reality, left behind them a code of agriculture, founded upon experience and results obtained, which is still in general use throughout the country—a code pointing out what is best to be done in practice, and one on which, with all their experience at home, the Spaniards have never been able to improve.

In reference to the effects produced by the present method of cultivating the land in Peru, an exact copy of that pursued in the time of the Incas, after describing the appearances of the coast, in the terms above quoted, M. d'Orbigny introduces the following passage:—

> Some days afterwards I had an opportunity of forming a correct notion of the extraordinary action of guano on the cultivation, as well as of the remarkable value which it gives to those small portions of land which agricultural industry has been able to detach from the sandy deserts of the coast. I made a tour into the valley of San Miguel de Sapa, about a league and a-half in the interior, by ascending a rivulet which falls into the sea near Arica. Between two sand-hills I found a charming oasis covered with cultivated patches, which were surrounded by rows of pomegranate, olive, and fig trees, mixed with the plantain and orange, all marked with a foliage so unlike, that one could not be compared with the other. These grounds are fertilized by small irrigating canals, which give to this sand, mixed with guano, the moisture requisite to centuple the produce. I was astonished to see so beautiful and permanent a crop of maize, and more especially of the red pepper, which constitutes the principal commerce carried on in these valleys, whence the growers send it off to all parts in the interior of Bolivia, where the inhabitants cannot dispense with the exciting fruit of this plant, by habit rendered indispensably necessary to them.

In the Peruvian valleys it is ascertained that the sugar-cane comes to maturity in eighteen months or two years, according to the locality, and yields several cuttings of after-growth. The produce of the *alfalfa*, a species of lucerne, as before stated, is prodigious. It grows to a great height, annually yielding six crops for an indefinite number of years.* The natives have experienced that guano manure is equally serviceable to shrubs and trees. After speaking of vegetation on the slopes, Dr Unanue thus describes that round the Peruvian capital:—

> But in the valleys it is that we see this prodigious vegetation in its greatest vigour. The country surrounding Lima is indeed one of those spots on which nature seems to exceed herself. The capital is encompassed by kitchen-gardens, which, to the west and south, form a double chain stretching along the internal and external inclosure of the walls. In them the vegetable kingdom unfolds all its pomp and bri-

* This manure would seem to be particularly well adapted for hops.

liancy. The trees grow with an astonishing rapidity, while there winter ceases to hold its sad and gloomy empire. The tops of the robust trees are always covered with fresh leaves, new ones coming before those which had began to fade fall off. In some plants the blossom and fructification are so abundant and so constantly sustained, that they reach from one year to another. Here may be seen oranges fast approaching to maturity on some branches, whilst others are clothed in flowers, and the fruit begins to form.

Guano is also of great use to the vine, and it is admitted that the district of Moquegua owes the abundance and quality of its wines to the application of this kind of manure in the early stages of growth. It not only gives health and robustness to trees and shrubs, but also enhances the beauty and flavour of European as well as indigenous fruits. Ulloa affirms that nowhere are the grape, pomegranate, peach, apricot, quince, &c., so beautiful and well flavoured as in the Peruvian valleys. He equally says the same of the *chirimoya* and other native fruits, and his testimony is fully borne out by that of other travellers. The brilliancy of the flowers at Lima, and along the coast, as well as the luxury of the ladies in using them, could not pass unnoticed. The banks of the Rimac, the Amancaes, Lorin, and other places within a short ride of the Peruvian capital, are so many enchanting gardens, where the flowers and evergreens of almost every part of the globe grow in the highest perfection. The price of a *puchero de flores*, or nosegay, varies from one rial to four dollars, according to the rarity and season, but at no time would a Limenian lady be without one in her boudoir, or in her hand, when she goes to the *alameda*. The humblest inhabitant dwelling in a cane-roofed shed may, if he chooses, at every breath inhale the fragrance of never-failing flowers.

Without quoting more authorities to elucidate the practice of the Peruvians in the use of guano, it will suffice to say that further particulars, connected with the subject, may be found in *Les Lettres Edifiantes* and *Les Annales de Voyages*. Since the preceding pages were written, information has been received that guano is now imported into British North America, from the coast of Labrador, in quality said to equal the African. By several navigators to the arctic regions we have been assured that, in their progress, they noticed countless numbers of sea-fowls, seals, and penguins, congregated on certain rocks and islets, and that at one season of the year large spaces on some localities are covered with bird's eggs. Of the existence of guano in these latitudes, consequently, there is no doubt, but how far it may have been affected by the greater humidity of the climate, remains to be ascertained.

As a curiosity, it may be worth mentioning that small guano accumulations were lately discovered at Paris in the turrets of the cathedral of Notre Dame. Since the reconstruc-

tion of this edifice, in the 12th century, it was well known that secluded places on the roof, at different periods, became the retreat of crows, pigeons, owls, and other minor birds, whose dung, united, decomposed, and recomposed, by time, heat, and humidity, gradually accumulated, and remained neglected, till the properties of bird droppings were made a general topic of conversation in France. These recesses were accordingly explored, when samples of the deposits were obtained and sent to the Academy of Sciences for their report. This incident strongly reminds me of what I have stated in the first division of my subject, respecting crow's droppings in the Balsola cave, and the accumulations likely to be found in the haunts frequented by vultures along the cliffs rising above Orduña.* When the French seek guano in the turrets of their old churches, ought not we to look for it in the crags and caverns along the coasts of both Scotland and Ireland, where birds, living on the produce of the sea, have for ages been accustomed to nestle?

According to letters received from Ichaboe, and dated towards the close of August, it appears that, up to that period, 120 vessels had arrived there in search of cargoes, and several more were also expected. Allowing 400 tons to be the average stowage of each, it is therefore believed that, in the course of the current year, (1844,) we shall have received from 65,000 to 70,000 tons of guano from that quarter alone, independent of about 25,000 from Peru,† an amount which will be considered large, when it is borne in mind that, in 1843, we did not import more than about 20,000 tons; in 1842, only half that quantity; in 1841, no more than two cargoes, or 800 tons; and in 1840, when our agriculturists were first made acquainted with the article, 20 casks.

The Ichaboe vessels are now fast arriving in different parts of the United Kingdom, more especially at Liverpool, where the abundance of African guano has become so great, that some cargoes on board were sold at auction, and others bought in, owing to a remunerating price not being offered. As an encouragement to this new branch of trade, by a recent order from the Lords Commissioners of Her Majesty's Treasury, guano, imported in British bottoms from Ichaboe, or other places on the African coast, when sold at auction, for the first time has been exempted from the payment of half per cent. duty heretofore charged.

The arrivals at Liverpool have, in fact, of late, so far outstripped the demand, that it was deemed necessary to bond seve-

* Vide Journal of Agriculture for October 1844.

† Allowing 3 cwt. of guano as sufficient for manuring one imperial acre, this quantity of 95,000 tons imported would manure 633,333 acres.—Editors.

argoes, in consequence of which the stench emitted from so a quantity, stored in the Queen's warehouses, became so erable, that at one moment the porters employed in them ally refused to continue working. Towards the middle of mber, the market was so plentifully supplied, that ordinary boe was selling at £5 : 12 : 6, and choice at £6 per ton, Peruvian held up at £10, a proof that its quality is pred. It was, however, confidently expected that the demand xportation would increase, as at the present reduced price nents had already commenced to Hamburg, and considerable rs had also been received from France, for the vineyards, e it would seem that the Peruvian practice of guanoing the was coming into fashion.

fore closing these remarks, it may not be out of place to that guano was tried in one of our remote colonies long re it was used in England. In his "Tracts relative to the d of St Helena," (Lond., 1816,) General Beatson, a scienand experienced agriculturist, speaking of the three kinds of ures which he there used for potatoes, in 1809, and at the he was governor, says that guano, at 35 bushels per acre, given space, yielded him 639 lbs.; horse-dung, at 35 carts, or 420 bushels per acre, 625 lbs.; hogs' litter, in the same ortion, 534 lbs.; and no manure, 446 lbs. He also gives in il the results of his experiments on grass lands, as well as in ultivation of mangel-würzel, in both instances exhibiting the rful effects of guano. The General took occasion further to e, that he first became acquainted with the virtues of the ivian fertilizer, through a communication from Sir Joseph s, the accuracy of whose information on the subject, he owledged, had been amply confirmed by his own experience; ng that 35 bushels, or 3 cart-loads of guano per acre, aped to him equivalent in effect to 70 loads of good rotten .

fter the General's return to Europe, it does not appear that t Helena any advantage was taken of these encouraging riments in reference to guano. In another of our more imant colonies it may, however, now be confidently expected this new manure will soon come into extensive use. Accordo recent advices received from Jamaica, it would seem that planters have at length discovered that guano is admirably suited for the sugar-cane; and, in the course of their experits, they have further ascertained that its application is cheaper more beneficial than clearing new lands.

ropical cultivators are aware that nothing impoverishes the so much as growing successive crops of sugar, and hence, for y years past, our Jamaica planters have annually been ob-

liged to procure bone-dust and other manure from home; but this supply has always been found inadequate to their wants. If it is possible to judge from the spirit which has been roused in our West India islands by the late discussions in parliament regarding the importation of sugar, the planters are at length resolved to bestir themselves and trust to their own resources, in order to extricate themselves from difficulties into which they have been thrown by circumstances over which they had no control; and, if they set about their work with earnestness and perseverance, they cannot fail to be successful: for, after all their misfortunes, they have still before them abundant means, many of which, it might be said, are almost untried.

The universal cry is, that the amount of produce grown in our colonies must be increased. This is the only expedient whereby the planters possibly can retrieve their circumstances and regain the high position which they once held in society. This is the only mode in which they can retain their friends at home—those friends who have constantly supported their claims and advocated their interests in the mother country, that large and influential party through whose energies and devotion the foreign grower of colonial produce has been kept out of the British market. Our colonists ought not to forget that they have to contend against a formidable array of foreign planters, comparatively untaxed, and in the possession of suitable lands, which cost them a mere trifle —lands which they can cultivate, at a low charge, by means of slaves or natives earning a mere pittance. These competitors hold out the tempting bait of cheap sugar and cheap coffee to a population now accustomed to use both in increased quantities, to clamorous millions who have to support families on reduced wages. With us, sugar and coffee, in fact, are no longer consisidered luxuries, but articles of the first necessity, and the labouring classes will have them at a reasonable cost. Unless, therefore, our planters augment their crops of both, so as to meet the growing demand at home, the government will never be able to keep on those restrictions which have been imposed for the protection of British grown produce.

If, with a full comprehension of their wants, our colonists solicited protection, and it was granted, the strength and arguments of their opponents will, ere this, have convinced them that they must make strenuous and lasting efforts to merit the continuance of that preferance, the advantages of which they are experiencing. If labourers are so scarce that, for the present, they cannot extend their plantations by clearing more lands, at least let the productive powers of their old ones be increased by a new and enlightened system of manuring. The facilities for this they will find in the use of guano, the same manure which, by a judicious

application, has for centuries doubled the produce of the sugar-cane on the same lands in Peru—a manure which, as I have before stated, Jamaica proprietors might obtain direct from the Pacific, at an extremely moderate charge, if suitable arrangements for that purpose were only made.

ON LIME AND ITS COMPOUNDS, AND THEIR INFLUENCE ON AGRICULTURE.

(*Continued from p. 592.*)

By Mr THOMAS ROWLANDSON, Liverpool.

SINCE writing the preceding, I have seen the third edition of "Liebig's Chemistry in its Application to Agriculture and Physiology," in the appendix to the first part of which I find the following experiments of Wiegmann and Polstorf.

The composition of the artificial soil used in the experiments of Wiegmann and Polstorf, on the organic ingredients of plants, (Prieschroft, p. 9,) was as follows:—

Quartzy Sand,	861.26	Acid of Peat with Potash,	3.41
Sulphate of Potash,	0.34	Do. do. Soda,	2.22
Chloride of Sodium,	0.13	Do. do. Ammonia,	10.29
Gypsum, (anthydrous,)	1.25	Do. do. Lime,	3.07
Chalk, (elutriated,)	10.00	Do. do. Magnesia,	1.97
Carbonate of Magnesia,	5.00	Do. do. Peroxide of Iron,	3.32
Peroxide of Manganese,	2.50	Do. do. Alumina,	4.64
Peroxide of Iron,	10.00	Insoluble Acid of Peat,	50.00
Hydrated Alumina,	15.00		
Phosphate of Lime,	15.60		1000.00

Experiments were tried on pure sand, and the artificial soil composed as above, with the following plants—viz., *Vicia sativa*, *Hordeum vulgare*, *Avena sativa*, *Polygonum fagopyrum*, *Nicotiana tabacum*, and *Trifolium pratense*. The experiments, which are exceedingly interesting, were made for the purpose of shewing the effects of the alkalis and salts on vegetation, with which, however, I have nothing to do on the present occasion; it is with regard to the note appended to the same that I have now to remark. It states, (the note)—This salt (acid of peat with potash) was made by boiling common peat with weak potash lye, and precipitating, by means of sulphuric acid, the dark-coloured solution. This precipitate is that termed torfsæure (acid of peat) in the above analysis. The salts of this acid, referred to in the analysis, were obtained by dissolving this acid in potash, soda, or ammonia, and by evaporating the solutions; the salts of magnesia, lime, peroxide of iron, and alumina were obtained by saturating this solu-

tion with their respective bases, by which means double decomposition was effected. Humus is the substance remaining by the decay of animal and vegetable matters, which are seldom absent from a soil. This was replaced by the acid of peat in the experiments of Wiegmann and Polstorf. When the acid of peat is boiled for some time with water, it passes into an insoluble modification, denoted above as insoluble acid of peat.

Seeing the above in a work of such deservedly high repute, I was led to doubt my previous experiments, or, at all events, the conclusions which I had drawn from them, and therefore immediately began a fresh set of experiments, which not only fully confirmed my former opinions, but did more—by pursuing the investigation further of the effects produced on other alkaline bases (peroxide of iron, salts of alumina, lead, &c.) by humic acid, still further corroborated the correctness of the theory here set forth, of the cause of the beneficial action of lime on what are termed sour lands, a property, I may here mention, also possessed by several other bases.

In the above-quoted analysis, we find what may be termed the following incompatibles, viz. :—

Gypsum,	1.25	Hydrate of Alumina,	15.00	
Chalk,	10.00	Humate of Potash,	3.41	Soluble Salts.
Carbonate of Magnesia,	5.00	Do. Soda,	2.22	
Peroxide of Iron,	10.00	Do. Ammonia,	10.29	

The probable products by double decomposition of the above would yield sulphate and carbonate of potash, carbonate of soda, carbonate and free ammonia, whilst the humic acid would combine with the lime of the gypsum, the alumina and peroxide of iron forming insoluble salts of these bases, whilst the insoluble acid of peat, of Wiegmann's analysis, would slowly combine with the chalk, &c., forming further insoluble salts with the gradual evolution of carbonic acid. The correctness of the above assertions have been fully tested by the writer, and the results compared with like experiments made with bog water procured from Knowsby Moss, (at the back of the Earl of Derby's seat.) On the first occasion,* I procured the humic acid by saturating peat (from the before-named moss) with ammonia; in the second set of experiments, by using a solution of caustic potash: the results were alike with one alkali as the other. On treating the solution of potash and peat with oxalic, sulphuric, muriatic, nitric, and acetic acids, a light flocculent and deep brown-coloured precipitate was obtained, which, on being washed and filtered, again assumed the soluble brown-coloured state when treated with a

* That is, the experiment made for this paper. My original experiments were made in Ireland.

little potash or ammonia. The *modus operandi* of preparing the humate of potash (humic acid) having been sufficiently explained, I shall, in future, always term them humate of potash or humic acid, as the case may be; anything analogous to the empirical basis called humus or humin I have never found, and strongly doubt its existence.

In the experiments of Wiegmann and Polstorf it is stated that the acid of peat and its salts were mixed with thin artificial soil, in order to replace the humus of the continental chemists, which is supposed to exist in all fertile soils, (and stated to be produced by the decay of animal and vegetable matters;*) but it must be evident, from the preceding observations, that the cause of the fertility of the artificial soil arose in a great measure in consequence of the chalk, gypsum, carbonate of magnesia, &c., neutralizing and converting the soluble humate of potash, soda, and ammonia, into the insoluble humate of lime; otherwise I am convinced, from practical experience, that not one of the plants experimented on would have grown with any degree of vigour, except the *Polygonum fagopyrum*, and the next in luxuriance would have been the *Avena sativa*. At a future period I shall have occasion to refer to this circumstance. I shall proceed to confirm the correctness of the experiments made in this paper by quoting some that were made by the continental chemist Bracannot, on some decayed wheat which had remained many centuries in a damp vault, (and consequently similar to the decay of vegetable matters in our bogs and mosses,) the issues from which were stopped up by earth, and of which the existence was forgotten, until by chance it was again discovered. The grains had preserved their forms and the brightness of their outside skin, but they were black, and were reduced by the slightest pressure to a black powder.

The water with which they were boiled was coloured yellow, and it left, after being evaporated, a saline mass of a brownish yellow, which burned with slight explosions when heated, and which, beside the substance cited, soluble in water, contained nitrate of potash, nitrate of lime, and a little of the muriates of potash and lime—the nitrates were the result of the oxidation, and of the nitrogen contained in the gluten and vegetable albumen, and of the combination of the nitric acid thus produced with

* I have every reason for believing that this substance (humic acid) is only produced by the decay of vegetable, and never by animal matters, at ordinary temperatures. From an analysis made on some colours manufactured for the use of painters, and called Chinese lake, I am of opinion that this acid is produced at high temperature and peculiar processes of management, from such animal matters as horns, hoofs; and a small quantity of humic acid is to be found in the soot produced by the combustion of coal.

the bases previously combined with vegetable matter. The weight of this mass soluble in water, including the salts and all other principles, did not exceed one and a-half per cent. of the weight of the black grain. When the part insoluble in water was boiled in alcohol, a small trace of a brown substance was taken up, which remained after evaporating the alcohol, and had the consistence of wax. The mass exhausted of its soluble parts by boiling water and alcohol was then heated slowly with a weak solution of caustic potash, which became *saturated and coloured of a blackish brown*; and this treatment was continued as long as new potash lye took up anything. This substance was precipitated from the solution by an acid; it was the body similar to *apotheme*,* and of which the weight amounted to 26½ per cent. The portion of matter insoluble in the alkali preserved the same appearance. This, exposed to the action of diluted muriatic acid, yielded to it a certain quantity of lime, of oxide of iron, and phosphate of lime. The residue was again acted on by potash which took up a new and very large proportion of the body similar to *apotheme*. This was after that combined with lime *and resisted in that state the action of potash.* This calcareous combination amounted to $\frac{48}{100}$; the 30 per cent. remaining consisted of a black carbonaceous matter, insoluble in the solvent used. Of the numerous works and experiments made, both by English and continental chemists, on the action of lime and the formation of humic acid, none are so completely confirmatory of my own observations as the above quoted from Braconnot. In all the others I have perceived a discrepancy; for instance, Wiegmann and Polstorf allude to the insoluble acid of peat, by which they must mean insoluble *in water*, as I have invariably found it (the acid) soluble in the alkalis, (ammonia, potash, and soda,) and forming insoluble compounds with limes, magnesia, barytes, alumina, iron, and lead; yet, in contradistinction to this, Liebig, in his third edition, at chap. 12, "Vegetable Mould," says—

> Boiling water extracts several substances from vegetable mould, and acquires a yellow or yellowish brown colour, which is dissipated by absorption of oxygen from the air, a black flocculent deposite being formed. When the coloured solution is evaporated, a residue is left, which becomes black on being heated to redness, and afterwards yields carbonate of potash when treated with water.
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> A solution of caustic potash becomes black when placed in contact with vegetable mould, and the addition of acetic acid to the coloured solution causes no precipitate or turbidity. But dilute sulphuric acid throws down a light flocculent precipitate of a brown or black colour, from which the acid can be removed with difficulty by

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* What Berzelius terms apotheme is "a deposit slightly soluble in water, produced in an aqueous solution of vegetable extract during slow evaporation, and containing a larger proportion of carbon than does an equal weight of extract."

means of water. When this precipitate, after having been washed with water, is brought, whilst moist, under a receiver filled with oxygen, the gas is absorbed with great rapidity, and the same thing takes place when the precipitate is dried in the air. In the perfect dry state, it has entirely lost its solubility in water, and even alkalis dissolve only traces of it.

I have had occasion, in a previous part of this paper, to allude to the circumstance that it is only barren and unfertile soils which yield this brown-coloured solution to certain of the alkalis, and the same thing is observed by Liebig in the earlier part of his work. In my experiments I always found that acetic acid did eventually precipitate humic acid from the potash solution of peat, and I also found that, when the humic acid had been precipitated, and the moisture evaporated at a temperature above the boiling point, that the dry humic acid would still dissolve in potash, but was totally insoluble in water.

I am afraid the reader will consider the length to which I have caused the dissertation on humic acid and its properties to extend to be exceedingly prolix. I trust, however, to be enabled to shew that it is not altogether destitute of being applied to the practical purposes of agriculture. I think it will be admitted that, from the preceding observations, drawn not only from the experiments detailed in this paper, but also from the concurrent testimony of the several able chemists whose opinions I have quoted, that humic acid is a general product of the decay (in the humid way) of vegetable substances, but particularly so when several of the alkalis and their carbonates are present. It has been clearly shewn that humic acid forms the greater portion of our peat mosses. Liebig observes "that the barks of firs and pines are completely soluble in potash lye, forming a liquid of a dark brown colour, which yields, on the addition of an acid, a precipitate strongly resembling the substance called humic acid."* Further, "when a branch of a willow is allowed to vegetate in rain water, the latter assumes gradually a dark brown colour. The same phenomenon is observed in bulbous plants (such as hyacinths) allowed to grow in pure water. It therefore cannot be denied that excrements are actually separated by plants, although it is very possible that they do not all separate them in the same degree." There is, therefore, strong reason to suppose that a continual accumulation of humic acid will take place in all soils, and which is only kept in check by counteracting circumstances; and as we always find

* I strongly suspect that the colouring matter only arises from the fact of humic acid forming the exterior coating of most trees, and will be found proportionally more exuberant on trees which are grown in the vicinity of towns, or on barren lands destitute of the alkalis and phosphates; at all events, under these circumstances, I have ever found the greatest deposit of humic acid on the barks of such trees as I have examined for the purpose of *ascertaining its presence*.

that its presence in a free state is injurious to vegetation, it becomes a question of some importance as to the best mode of neutralizing its effects when existing in a soil, or to prevent its being present in the manures which we may apply to our cultivated crops. Much has been stated of the injury sustained by our farmers by permitting the brown-coloured liquid which exudes from their dung-heaps to run to waste, but the experience of all the practical men with whom I have conversed on the subject coincides with my own, viz., that the brown-coloured liquid alluded to, when applied to the land in a separate state, is never found to be of the slightest benefit. I have repeatedly made the experiment, but could never satisfy myself that the land, or rather the plants growing on it, derived any advantage from the application. As a specimen of the mode in which this matter is spoken of, I shall quote Mr Skilling, manager of the farm at Glasnevin, near Dublin, (delivered, I believe, as a lecture.)

> These facts ought to startle the farmer and make him reflect, that the black fœtid fluid which oozes from his dung heap, and is washed away to the grip, or suffered to evaporate in the air, is the true food and substance of plants already prepared (cooked as it were) for their use; and this is the reason why the same substance acts so instantaneously and effectually on almost every plant to which it is applied in its pure state. These considerations should induce him to hoard this liquid like gold in the chest. This is the essence of his manure, the spirit of his dung-heap; when this is gone, what remains is comparatively inert and useless.

Before Mr Skilling spoke so emphatically on this point, it would have been well if he had made a few comparative experiments, which if he had done he would have found that no such exuberant luxuriant vegetation will take place by the application of the precious liquid which he eulogizes so highly. That a considerable quantity of ammonia, potash, and soda, in combination with humic acid, (and which is the cause of the brown colour,) exists in the liquid in question is certain, but in a state which is prejudicial to nearly all the cultivated plants,* and were it even beneficial, the effect could only be very trifling, as, from its great solubility, it would be washed away by the first shower of rain. It is, therefore, a question of some moment whether mild-lime might not be sprinkled over our dunghills with advantage, or, if not, a copious supply of gypsum ought to be strewn over every layer, not only for the purpose of preventing the escape of the ammonia, but also to neutralize the deleterious effects of the humic acid which is so largely set free by the decomposition of the straw of

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* The various species of polygonum appear to be the plants which thrive best in the presence of humic acid. Amongst the cereals, rye grows the best, and oats the next; barley and wheat not at all, if much of the humatus or humic acid be present.

the litter, and the vegetable matter in the fœces of our cattle, which compose our ordinary farm-yard manure. When we consider that every atom of humic acid set free (unless lime be present) will rob the manure of an atom of ammonia, soda, or potash, the value of an application of lime to our manure-heaps, (whilst collecting, and generally in a state of fermentation,) will be better understood. I ought to remark that the lime or gypsum ought to be in a finely divided state, as I have found that the humate of lime is so insoluble that, if the exterior coating of either gypsum or lime becomes converted into humate of lime, no farther action takes place, the interior remaining either gypsum or pure lime, as the case may be. I caused some roughly powdered gypsum to be placed in a test-tube, together with some humate of potash, which, after slightly decolorizing it, ceased to have any farther action. I afterwards filtered the solution, and caused the gypsum to be still farther pulverized, and then poured the former solution upon it, which, in a few days, perfectly decolorized it, and gave, on testing the solution, the presence of sulphate of potash.

It has often been remarked that chemists make experiments in the laboratory, which, however plausible they may be in theory, are not such as are justified by the operations of nature. I have however been sufficiently fortunate as to have recently had a proof of the correctness of the general position contained in this paper respecting the action of lime, and that from nature's own laboratory, and where the experiment has been continued probably for many centuries.

In ordinary cases, where bogs exist, they are generally incumbent on stiff impervious clays, or clays mixed with a quartzose paste, so compact as scarcely to permit the smallest portion of moisture to permeate it. In such cases, the humates of ammonia and potash pass off between the lower part of the bog and subsoil; but in the borough of Liverpool there is a considerable tract of land which was formerly a morass, and which is known by the name of Mosslake Fields. This, at the present day, consists of a thin layer of peat, very much mixed with sand, running from a few inches to three or four feet in thickness, and the immediate substratum of which is a porous sand; the layer of sand next to the peat is of a deep brown or rather black colour, about a foot below this it becomes a brown, (strictly so speaking,) and, as we descend, becomes of a paler colour, until the whole has the same appearance as ordinary bright sea sand.

It may be said that the brown colour in the sand has been caused by the decay of roots, but the appearance of the sand at a depth below a foot from the bottom of the peat completely

contradicts such a view of the case, independent of the circumstance that the herbage, which exists on similar places in the neighbourhood, being plants which, though they possess strongly ramified superficial roots, do not penetrate to any depth. The only reasonable and probable cause for this brown appearance is to be accounted for from the circumstance that the humate of ammonia, formed by every shower of rain, gradually percolated through the sand, and, from causes easily to be accounted for, the ammonia has, in the course of time, escaped and left the humic acid free and mixed with the sand. For the purpose of ascertaining whether such was the fact, I procured some specimens of the peat,* being the surface soil, some deep-coloured sand about a foot below the peat, and also some sand about two feet below the bottom of the peat. The peat, when treated with potash, exhibited the ordinary appearances of humic acid; the deep-coloured sand, obtained from a foot beneath the peat, exhibited the same appearance. The whole of the humic acid was extracted by the aid of caustic potash, and I procured the sand by repeated applications of potash of a shining white colour, having only a very few dark-coloured particles mixed with it, (which I suspect was the titaniate of iron, which is found on the shores of the Dee and the Mersey,) but too small a quantity to be worth while collecting.

On, however, treating with caustic potash the brown-coloured sand, from a depth of two feet below the bottom of the peat, I was rather surprised at not discovering the slightest alteration in its appearance. The solution of potash was decanted, and the residuum well washed in water, and a little hydrocloric (muriatic) acid was poured on it, I was much surprised to observe that a strong effervescence took place—the dark coloured portions separated (but not in solution from the sand) and finally settled on the top of the siliceous sand. I was now pretty certain that the humic acid in the lower portion was in combination with lime. A small portion of the liquid was poured into another test-tube containing a small quantity of oxalic acid in solution, when, in a few minutes, a tolerably copious white precipitate took place, an indication of the presence of lime. Neither acids nor alkalis had any effect upon the brown or black matter obtained in this last experiment, though it was not obtained in sufficient quantity to make any decisive experiments as to its nature; but, I think, on that head there can scarcely be a doubt. The calcareous

* These specimens were taken from a place near the tan-yard in Toxteth Park, where some small allotments are made. There is a straight ditch running along one side of the small parcels of land, which fully displays what has been stated above.

matter in this case was, doubtless, the remains of minute sea shells. The reason why no calcareous matter existed in the superior strata was probably in consequence of the upper portion having been blown over the lower long after the latter had been upraised from the sea.

TUSSAC GRASS OF THE FALKLAND ISLANDS.

By the Rev. James Duncan, M.W.S.

So much has of late been said respecting this grass, and such high expectations have been formed of it proving a valuable acquisition if introduced and propagated in this country, that a brief description of its appearance and properties can scarcely fail, we think, to be acceptable to the readers of this journal. Although not brought prominently into notice till the recent voyage of discovery in the antarctic regions, under the superintendence of Captain Ross, it has been long known to botanists, and is alluded to by most of the navigators who have touched at the islands which form its principal locality since the days of Cook. Its botanical characters, however, do not seem to have been closely examined, nor rightly understood, until investigated by Sir W. J. Hooker, who has given an account of it, accompanied with a coloured representation, in a pamphlet entitled "Notes on the Botany of the Antarctic Voyage." Neither does it seem to have occurred to those who first noticed this grass that it was calculated to flourish on the shores of northern Europe, the circumstance which now claims for it such a degree of attention.

It is called the Tussac grass from its habit of growth, the roots becoming densely matted together, and the lower parts of the stalks forming a large tuft or *tussack*. These basal or columnar portions, formed by the close approximation of the stems or culms, often rise to a considerable height—from four to six feet; the long tapering leaves then diverge from them, and hang down all around, often in a very graceful curve, like the falling waters of a *jet d'eau*. These masses are insulated, generally a few feet apart, and the leaves, meeting above, form a kind of arched roof, beneath which the ground is generally quite bare of vegetation. A *tussac ground* thus forms a complete labyrinth, and a man may walk among its green arcades completely concealed from view. Nay, a house may be formed of it in a very short time: the inclined stems, when fastened together, may be made to serve as

a roof, while the dry leaves about the root make a tolerably good bed. Bougainville states that he often in this way obtained shelter for himself during his wanderings. This, however, refers to the plant in its most luxuriant state of growth: it is often so low as scarcely to afford adequate shelter to the flocks of penguins which resort to it for the purpose of building their nests and rearing their young.

By the earlier naturalists who examined this grass, it was thought to be a fescue, and we accordingly have it referred to under the names of *Festuca flabellata* and *Festuca cæspitosa.* Forster notices it under the name of *Dactylis cæspitosa*, and that appellation is now retained, as a careful examination of its character leaves no doubt that it belongs to the genus *Dactylis.* It has thus a generic relationship to a well-known grass in this country, the *Dactylis glomerata*, or cock's-foot—a strong, coarse grass, insulated tufts of which may be seen growing by the side of every hedgerow and field. The tussac is perennial; the root consists of a dense mass of tortuous fibres. The stems, which spring from the little hillock formed by the roots, are numerous, erect, branched or divided only at the base, from three to four feet long, smooth, and compressed. The leaves are numerous, the lower ones very long, not unfrequently from five to seven feet, about an inch broad at the base, and gradually tapering to a point; from above the middle they are curved downwards, or even pendent; the stem-leaves become gradually shorter upwards, and are of a pale glaucous or sea-green colour; the other leaves are pale yellow. The panicle is a span long or upwards, very dense, forming a somewhat interrupted spike, nearly two inches broad, compressed and obtuse; the branches short and erect; the rachis angled. "Spikelet composed of three or four florets, of a pale yellow-green colour. The calycine glumes are lanceolate, acuminate, longer than the spike of flowers, slightly keeled, shortly ciliated on the back, three and a-half lines long, the margins a little involute, and, as well as the apex, membranous and transparent, the superior one a little longer than the other, three-nerved, the nerves ciliated. The lower glume or palea of the corolla is ovate, concave, compressed, and sharply keeled; bluntly trifid at the apex, five-nerved. Stamens three. Anthers pale yellow. Ovary nearly ovate and glabrous. Fruit elongate-ovate, or almost cylindrical, slightly trigonous, of a pale yellow colour, and smooth."*

It will at once appear, from the length and breadth of the leaves the dimensions of the culms, and the profusion in which

* ... "Notes on the Botany of the Antarctic Voyage," p. 50.

both these are produced, what an immense quantity of herbage this plant is calculated to afford. Both the leaves and stems abound in saccharine matter, and form a most nutritious food. The inner portion of the stem, for a little way above the root, is soft, crisp, well-flavoured, somewhat resembling the kernel of a nut, and is often eaten by the inhabitants of the Falkland islands. The young shoots also are boiled and eaten like asparagus. This tends to shew the wholesome nature of the whole plant as an esculent; but it is as affording pasturage for cattle that the tussac is to be chiefly valued. The Falkland islands have long been known to be inhabited by many wild cattle and troops of horses, and these are principally supported by this grass, which they prefer to every other kind of food. Not only these, but every herbivorous animal in these regions not only devours the tussac with avidity, but is affirmed to fatten on it in a short time. This predilection is shewn for it both in a green state and when dried, insomuch that cows and horses often eat the thatch from the roofs of the houses when it happens, as it often does, to be composed of tussac grass. "During several long rides," says Lieut. R. C. Moody, "into the country, I have always found the tussac flourishing most vigorously in spots exposed to the sea, and on soil unfit for any other plant, viz., the rankest peat-bog, black or red. It is singular to observe the beaten footpaths ofthe wild cattle and horses, marked like a foot-track across fields in England; extending for miles over barren moor-land, and always terminating in some point or peninsula covered with this favourite fodder; amid which one is almost certain to meet with solitary old bulls, or, perhaps, a herd of cattle—very likely a troop of wild horses, just trotting off as they scent the coming stranger from afar. I have not tried how it would be relished if made into hay, but cattle will eat the dry thatch off the roof of a house in winter; their preference to tussac grass being so great that they scent it a considerable distance, and use every effort to get at it. Some bundles, which had been stacked in the yard at the back of Government House, were quickly detected, and the cattle from the village made, every night, repeated attempts to reach them, which occasioned great trouble to the sentry upon duty." It is the opinion of those who have visited the Falkland islands that, if proper attention were paid to the propagation of the tussac grass, and if it were prevented from being entirely eaten down in those places where it now abounds, it would, of itself, without aid from the other indigenous vegetation, not only yield abundant pasturage to all the cattle now existing there, but would support as many as there is ever likely to be a demand for in that quarter of the globe.

The islands just mentioned may be said to form the metropolis

of this interesting plant, and, as far as yet known, its geographical range is comprehended within the 50° and 60° S. latitude. Forster found it in New-Year's Island, Staten Land. Commerson sites the Straits of Magelhaens as one of its localities; and Dr Hooker saw it on Hermite Island, Cape Horn. It has also been noticed in considerable quantity in some of the smaller of the Auckland group of islands.

It is generally found growing near the shore, and flourishes best where the saline spray dashes over it. Indeed exposure to the sea breeze, and the peculiar influences which emanate from the ocean, are conditions which seem essential to its prosperity. It is then only that it reaches its most stately proportions, and assumes that exuberant and imposing form, which have led one author to speak of it as the "splendid tussac grass, the gold and glory of the Falklands." As it recedes from the ocean, it becomes dwarfed and sickly, as if out of its kindred and appropriate element, in this respect resembling our own native *Arundo arenaria*, *Triticum junceum*, and certain other gramineous plants. As with these also, and a considerable number of other species, the glaucous colour of the tussac grass may be regarded as indicating it to be a littoral plant; for it would seem as if many of the plants growing near the sea caught their hues, as they are known to acquire certain other of their properties, from the element in their vicinity. It is probable that the saline matter the plant derives from the spray and sea breezes, contributes not a little to render it so palatable to cattle. The ground on which the tussac grass flourishes best is a wet peaty soil, often very bleak and poor, and scarcely capable of sustaining any other kind of herbage.

It seems to be the almost unanimous opinion of those who have examined this plant in its native localities, that it would succeed in certain situations in our own country. A writer in the "Guernsey Star" newspaper, who appears familiar with the subject, expresses his hope that the "splendid tussac grass will yet make the fortune of Orkney and the owners of Irish peat-bogs." The Governor of the Falkland islands, Lieutenant R. C. Moody, is of opinion that "the wild west coast of Ireland would exactly suit this grass." Mr Lyall, of the discovery ship "*Terror*," than whom no one has more zealously investigated the botany of these regions, in a communication to the writer of this notice, says, "I should think that sheltered spots near the beach, on some of the smaller of our western islands, are the situations in which the tussac grass is most likely to succeed." Sir W. J. Hooker says, "The nature of the soil and climate producing this grass gives every reason to believe that the shores of a vast extent of England, Scotland, and Ireland

would suit it equally well; more especially the western coasts of the two latter countries."

In these circumstances, public curiosity could scarcely fail to be excited, and some degree of interest to be attached to the attempts made to introduce the grass into Britain. No living plants ever reached this country. Dr Hooker did, indeed, dispatch some young plants in cases, but they perished during the voyage. The seeds have been found to germinate freely in the Governor's garden in the Falkland islands; and it was thought there was every probability that they would likewise do so when transported to this country. The first attempt to rear the plant from seed in Britain was made by Sir W. J. Hooker, in Kew Gardens, but he entirely failed. Last winter, a package of seed, carefully collected and preserved by himself, was presented to the writer of this notice by Mr Lyall of the "*Terror*." It was duly sown last April in a garden in the village of Denholm, Roxburghshire, and carefully attended to; but although the seeds seemed healthy, and in good condition, not one germinated. Seeds collected at the same time, and by the same individual, were sown in Kew Gardens, but the result was the same. The Highland and Agricultural Society of Scotland lately purchased two lbs. of seed, which had been sent to the colonial office. It has been intrusted to the care of Mr Lawson, the society's seedsman, and, if it fail to grow, it will be from no want of attention or skilful treatment. It was lately stated in the newspapers that Dr Murray of Hull had succeeded in raising several plants from seed given to him by Sir W. J. Hooker, and his success was ascribed to his having steeped the seed in some chemical solution previous to sowing it.

It is not easy to see any reason why the tussac grass should not succeed, at least to a certain extent, in this country. The climate, soil, and most other conditions, are not so different from those it meets with in its native regions as to be likely to form insuperable obstacles. It should be remembered, also, that the grasses in general have a very wide geographical range; some of them, in fact, such as the *Poa annua*, perhaps approach nearer to true cosmopolites than any other distinctly flowering plant. The high utility of this tribe of plants in affording food to animals, might lead us beforehand to imagine that they would be widely distributed, readily propagated, and possess the power of accommodating themselves with facility to a change of circumstances. This we accordingly find to be the case in a singular degree, and it affords a fair presumption of success in any attempt to bring a grass from one country for the purpose of being cultivated in another. In the present instance, one of the circumstances which indicates most strikingly that the influences under which

the tussac flourishes in a southern latitude are not remarkably different from those to which it would be subjected in a northern one, is the fact that, on the very same grounds where it prospers is to be found a variety of plants which also grow naturally in Britain. Among these are the common grasses, *Lolium perenne*, *Aira flexuosa*, and a species of *Triticum*, probably *T. junceum*. If these grasses thrive in the Falkland islands under the same conditions as the tussac, it may be fairly inferred that the latter would not refuse to grow in Britain, where they find all that is necessary for their prosperity. Among the other British plants growing in the Falkland islands may be mentioned *Apium graveolens*, *Cerastium vulgatum*, *Alsine media*, *Senecio vulgaris*, *Veronica serpyllifolia*, and *Rumex acetosella*. In fact, the general aspect of the vegetation is essentially European, and in not a few respects resembles that of Great Britain. We shall probably, however, be disappointed if we expect the tussac to reach its utmost state of luxuriance in this country, and to form those huge and almost arborescent masses of herbage, an assemblage of which resembles a thick-set copsewood, or a miniature forest; but even in a dwarfed and imperfect condition, it could not fail to be an important addition to our native grasses, and would still greatly exceed the dimensions even of the most stately of them.

When cultivated in the Falkland islands, it is recommended either that the seed should be sown in patches, just below the surface of the earth, and at distances of about two feet apart or that it should be drilled in rows, like turnips. Treated in the latter way, it was found to spring up strongly from the seed. It must, however, be taken into consideration, as remarked by Sir W. J. Hooker, that, in order that it may thrive in this country, the plant must so far change its habits of the southern hemisphere as to forget that our winter is its summer, and *vice versa*.

The merits of the above grass have probably been the cause of another similar production of the Falkland islands having been in a great measure overlooked, although its qualities seem to be such as to entitle it to attention. This is a kind of fescue grass, the *Festuca alopecurus* of D'Urville, and the *Arundo alopecurus* of Gaudichaud. In a report transmitted to Lord Stanley, it is spoken of in the following terms:—

Another grass, however, and of more extensive distribution than the tussac, scarcely yields to it in nutritious qualities. It covers every peat-bog with a dense and rich clothing of green in summer, and a pale-yellow good hay during the winter season. This hay, though formed by nature without the operation of mowing and drying, keeps those cattle which have not access to the tussac in excellent condition, as was proved by the beef with which our hunting parties supplied, for four months, the discovery ships. No bog, however rank, seems too [illegible] this plant to luxuriate upon, and, as was observed during a surveying

excursion which had been made to Port William, although the soil on the quartz districts was very unprolific in many good grasses which flourish on the slate-clay, and was, generally speaking, of the worst description, still this fescue-grass did not appear to be affected by the difference, nor did the cattle fail to eat down large tracts of such pasturage.

The numerous troops of horses, too, on the flanks of the Wickham heights, can procure little other fodder; while those of Mount Lowe and Mount Vernet must depend upon it entirely. Should the tussac disappear from any part of the Falklands, where stall-fed cattle are kept, it might be desirable to treat this fescue grass as hay in England; by which process its nutritious qualities would, doubtless, be much better secured to the animals during winter than by suffering the leaves gradually to wither, and not gathering them till nature has evaporated all the juices. For sheep it might also answer well, when converted into hay, though it seems likely that the wet nature of this grass, together with the damp situation where it grows, would prevent these creatures thriving upon it, if restricted to such diet; and, at all events, newly imported flocks should not be suddenly removed from dry food to what is of so very succulent a nature.

ON THE PRODUCTION OF SOILS AND MANURES BY THE LOWER ORDERS OF PLANTS.

By Robert D. Thomson, M.D., Lecturer on Practical Chemistry in the University of Glasgow.*

The intimate connexion subsisting between the soil and plants might have led, one would have supposed, to an early appreciation of the fact that vegetables extract nourishment from the earth. Jethro Tull, however, informs us that, antecedent to himself, (in 1732,) no one having alluded to the subject, he was under the necessity of inventing a term to express what he meant by the method in which inorganic nourishment was taken up by plants. He termed it the *pasture* of vegetables; for he was quite convinced that, as cattle feed on vegetables that grow upon the external surface of the earth, the plants themselves must first receive from within the earth the nourishment they give to animals. By pasture Tull did not understand the pabulum itself, but the superficies from whence the food was received. By this term he meant the spaces between the particles of soil, and upon the surface of these particles he believed the roots of plants to pasture, or to imbibe, by their appropriate apparatus, fine portions of the soil. He argued that much nourishment cannot be derived from rocks or soils without interstices; and that, in proportion to the porous nature of the earth, or, in other words, to its fine state of division, is its fertility enhanced. The earth, he affirmed, is not deprived of its fertility by any other means than by fire and the roots of plants; for when vegetables are not

* Forming a Lecture delivered in the University of Glasgow.

allowed to grow on a soil, the latter will always grow richer. The operations of ploughing and harrowing, the circumstances of exposure to the sun, to the frost, to the action of water, and to mechanical pulverization, will only contribute to render the earth more fertile, provided fire and plants are withheld from acting upon it. By his sagacity in detecting this source of the nourishment of plants, Tull abolished the Virgilian agriculture in England, and produced a new era in the science, from which may be dated the commencement of all modern improvements in farming.

It is not a little remarkable that so acute a man as Lord Kames should have endeavoured to supplant the great doctrine of Tull by the old idea that the only use of the soil was to give support to the plant mechanically, and to hold water for its nourishment. Mr Kirwan was one of the first chemists who subjected the ashes of plants to examination, and he was succeeded by Saussure and Davy, who clearly demonstrated that the inorganic materials of vegetables were essential to their constitution. Saussure did not seem, however, to consider the vegetable matter of the soil as of any further utility than as supplying ashes or inorganic materials in a fluid form to the roots of vegetables; for he observes that the oxygen of the air removes carbon from the humus. The humus, in losing this element, gives off, at the same time, under the form of water, its oxygen and hydrogen, and an extract soluble in water. Hence the mould or humus appeared to him to be capable of entire decomposition at the usual temperature of the atmosphere, while the soluble extract, the residue of the decomposed humus, contributed in a certain proportion to its fertility, in consequence of the ashes of the extract containing all the principles of the ashes of vegetables.

It is quite obvious, therefore, from these views, that Saussure entertained no ideas similar to those of the *humus* theory, which, originating in Sweden, and passing into Germany, attracted a number of supporters, but never made its way into this country. Liebig, it is sufficiently well known, has in a great measure destroyed the basis upon which this highly improbable theory was raised, and has contributed essentially to supply us with more precise notions of the nature of manures, by demonstrating that it is upon the inorganic constituents rather than upon their organic ingredients that the value of manures depends.

[illegible] of the inorganic nature of manures.—The humus theory, which consists in supposing that decayed vegetable mould dissolved in water is capable of being taken up by plants, and supplying them with most of their solid nourishment, seemed still, however, to receive some support from the class of plants termed

lichens, so common upon our rocks, trees, and walls. It was believed by botanists that this lowly order of plants was destitute of roots, and that the seeming roots which retain them so closely in contact with the surface of rocks and trees, were designed for the purpose of fixing the plants in their place, and not for the sake of supplying them with nutriment, which was afforded solely by the air. If this view were correct, then it would follow that these plants could contain none of the ingredients of rocks, or, in other words, that lichens must be destitute of inorganic constituents, and that, if the humus theory be inaccurate, the mould produced by the decay of lichens cannot act as a source of nourishment to future vegetables. Now it is generally admitted that lichens are active producers of soil, and that they afford a mould for other plants to flourish in; hence they appeared to supply a strong argument for the humus theory. The experiments which we have made, however, in the Glasgow laboratory last year, have clearly demonstrated that the lichens afford the most powerful of all arguments against the humus theory, and present a beautiful illustration of the great work performed in nature by the lowest members of the vegetable kingdom. Our experiments also shew that lichens, contrary to the opinion of botanists, must be supplied with roots possessed of greater power than those of trees or herbs, and that, of all orders of plants, their capacity to take up inorganic matter, and deposit it as part of their constitution, is alone surpassed by the sea-weeds which, however, are surrounded on all sides by a nutritious inorganic atmosphere.

It was known that some lichens contained one or two inorganic constituents; but these were considered to be partial facts, and it does not appear to have occurred to chemists that inorganic matter is an essential ingredient in this class of plants. On heating 50 grains of a carefully picked specimen of *Parmelia parietina*, the yellow wall lichen, a common yellow incrustation on trees, rocks, and walls, I found that, after exposure to the highest temperature, a considerable quantity of matter remained which could not be expelled. The ash weighed 3.4 grains; in another experiment, 40 grains of the same plant left 2.7 grains of ash; and in a third experiment, 7 grains of the fresh leaf, or frond, most distant from the point of attachment to the rock, yielded a skeleton, preserving the shape of the lichen, weighing 0.47 grains, and consisting of silica, iron, and phosphates, &c. These three experiments afford the following per centage:—

1st.	2d.	3d.
6.8	6.75	6.71

A considerable portion of the plant was burned; the ashes were preserved and analyzed. The following is the result of two

analyses, in which I was assisted by my pupils, Messrs David and James Murdoch of Stirling:—

	1st.	2d.
Silica,	68.46	64.62
Sulphate, Phosphate, and Common Salt,	0.75	—
Peroxide of Iron, and Phosphates of Iron and Lime,	22.04	34.55
Carbonate of Lime,	8.75	—

The presence of the phosphoric acid was determined by digesting the precipitate produced on the addition of caustic ammonia in acetic acid, when the perphosphate of iron remained undissolved. These, and the subsequent experiments, were made from the autumn to the commencement of the winter of 1843,* and it is interesting to know that the results in reference to the presence of phosphoric acid, have been confirmed by analyses made at Giessen, and published in June of this year, (Annalen der Chemie, Juni 1844, p. 393.) It is also curious to observe, in comparing analysis made of the same lichens growing on different localities, how much larger the proportion of silica is in those plants which have vegetated on rocks than in those which have lived on the trunks of trees. At Giessen, the lichen under consideration, mixed with some others which were growing side by side on an apple tree, yielded about 50 per cent. of silica, while in the preceding results the amount of this ingredient approached 70 per cent. The specimens subjected to analysis were, however, derived from the surface of the mica slate rocks of Dunoon, in the Firth of Clyde, where a plentiful supply of silica was exhibited to their roots. This result is in accordance with the observation of Saussure, that plants which vegetate upon a mould derived from a siliceous rock furnish—other circumstances being alike—ashes that contain less lime and more silica than those growing upon a calcareous soil. The facts thus developed in reference to one species of lichen, so different from what was to be expected from previous experiments, led immediately to the examination of various other species. A specimen of *Parmelia saxatilis*, a common grey lichen, abundant on rocks and dykes, which had been collected on the banks of Loch Venachar, where it is extensively used by the inhabitants to impart, by means of an alum mordant, a purple colour to woollen cloths, was subjected to analysis—200 grains, when burned, left an ash which weighed 7.8 grains, consisting of substances exactly similar to those which have been described when treating of the yellow wall lichen.

A number of other species, for which I am indebted to the kindness of Dr Balfour, professor of botany, were also analyzed, and found to afford similar results. The following table contains

* Proceedings of the Philosophical Society of Glasgow, vol. i., p. 185.

a few determinations in which I was assisted by my pupil, Mr George Aitken of Glasgow:—

	Soluble Salts per cent.	Insoluble Salts per cent.	Total Ash per cent.
Cladonia rangiferina,	9.75	2.71	12.47
Scyphophorus pyxidatus,			6.09
... bellidiflorus,	0.59	0.59	1.18
Ramalina scopulorum,	0.33	3.84	4.18
Parmelia omiphalodes,	0.33	7.79	8.12
... saxatilis,			6.91
... parietina,			6.75
Cetraria islandica,			1.84

The ashes of those various species, being tested in the usual way, were found to be similar to the inorganic constituents which have been already described, viz., silica, peroxide of iron, phosphate of iron, phosphate of lime, and carbonate of lime.

Importance of the lowest order of plants in nature.—These examples are perhaps sufficient to enable us to draw the inference that this class of plants constitutes no exception to the rule which seems to pervade the vegetable kingdom, that inorganic matter is important to the life of the species into which it enters as a constituent, just as with animals whose skeletons cannot dispense with the presence of earthy and soluble salts. This view of the composition of lichens enables us clearly to distinguish the position which this lowly order of plants occupies in the economy of nature. In moist climates they are the never-failing tenants of the arid rocks; nor are the tropical stony masses destitute of their presence. On the contrary, they seem to thrive in all seasons and climates—withstanding, with equal facility, the scorching equinoxial heats and the frigidity of the most elevated mountain zones. It is interesting, then, to deduce from chemical details the importance of this extensive distribution throughout the domain of nature. When land first appears above the level of the ocean, one of the first organic beings which makes its habitation on the newly-discovered rock is some one of the species of plants to which we have been directing our attention. The barren island, stony and hard, is unfit for the purposes of supporting living beings, until it has been covered with a soil; this is effected by the disintegration of the rocky masses of which the island is composed, by the agency of moisture and heat, aided by other atmospheric causes. But a most important auxiliary is the lower orders of plants, which not only act by the mechanical separation of the particles of the rock, but also by imbibing the most influential of its nutritive ingredients, and bringing to the surface, as it were, a layer of living matter calculated for the support of vegetable beings. These plants, like other vegetables, wither and decay

to give place to a rising generation, which continues to extract similar materials from the rock. By continuation of this process, a layer of mould is deposited on the surface of the formerly barren mass, which is now calculated to serve as a place of growth for seeds, wafted by the waters of the ocean, or deposited by wandering wild fowl. There is no reason for inferring, however, that this mould acts upon the plants that grow in it by supplying humus, according to the old view, as a source of soluble nourishment. On the contrary, it may be inferred, from the experiments previously detailed, that the mould produced by the action of lichens, and the decay of the latter on the surface of rocks, influences a higher order of plants, by presenting to them a focus of the richest food, that has been carefully selected and deposited for their use by this too often despised order of vegetables; for when we compare the amount of inorganic matter existing in different tribes of plants, we find the lichens to be exceedingly rich in this commodity. This is particularly exhibited in the following table, constructed from my examination of lima wood, sapan wood, and sea-weeds, where the composition of 1000 grains of each of the plants is given:—

	Lima.	Sapan.	Lichens.	Algæ.
Organic Matter, ...	971.25	987.08	932.5	875.3762
Inorganic Matter, ...	28.75	12.92	67.5	124.7238

The species of lichens whose composition has been here selected are the yellow wall lichen and the rein-deer lichen, so abundant on our moors, while the specimen of sea-weed was brought from Cape Horn by Dr Joseph Hooker, in the expedition under Sir James Ross, and was of enormous magnitude. That sea-weeds should contain so much saline matter does not afford subject for much surprize, since the waters of the ocean supply an inexhaustible source of nourishment, in which, constantly imbedded and soaked, they can suck in food by every pore. It is different, however, with lichens, which have only one side in contact with the focus from which their inorganic constituents can be derived. It must, therefore, now be an interesting point for botanists to determine the nature of the roots or connecting links between the lichens and the source of their nourishment, which appear to be of such an efficient nature when brought in comparison with other orders of plants.

Mode of discovering the presence of manures in rocks.—But not only has the examination of lichens confirmed the most rational views of the true nature of manures, but it has also supplied us with important information respecting the nature of rocks, and of the useful purposes to which even our giant mountains may be applied for the service of the farmer. An analysis of lichens

derived from rocks will enable us to detect from whence supplies of the phosphates and other manures may be procured in the largest quantities, for the presence of these bodies in lichens is a direct demonstration of the existence of the same materials in the rocks upon which they grow. Our supplies of concentrated manures in the form of guano, bone earth, &c., cannot last long; but it is consolatory to think that, in our rocky mountains, there are deposits of food for plants from which these concentrated manures must primarily have been derived, and to which we may again have recourse directly for stores of manure. It does not seem necessary that the phosphates should be extracted from the rocks in which they are contained by any expensive chemical process; but those masses which may be found by chemical analysis to contain any considerable amount of these salts, might be applied in a pulverized state to the soil directly. The same method of application might also be adopted in reference to the supply of alkalis for agricultural purposes. Many of our rocks, such as trap and granite, which contain abundance of the alkalis, and are susceptible, under atmospherical influences, of rapid decay, might be applied in a pulverulent form to the soil. Immense masses of trap, broken for the purposes of mending the roads at Glasgow, have decomposed in a few months into fine gravel; while every one is familiar with the Cornish clay, used for the manufacture of porcelain, a product of the rapid decomposition of the felspathic constituent of the granite of Cornwall, and whose extrication must have been accompanied with the separation of a large amount of alkalis. All these facts indicate that farmers need not despair of possessing, by the agency of chemistry, inexhaustible sources of manure; for, since all soils must have been originally derived from the adjacent strata, it is sufficiently obvious that new soils may be formed by simple methods.

The experiments which have been detailed in this paper, will, it is hoped, tend to elucidate the important function which the lower orders of plants fulfil in the domain of nature, and they likewise, it is conceived, remove satisfactorily the last argument which remained for the existence of the humus theory.

Air plants require inorganic food.—There still, however, is presented to our notice, a class of plants which might be quoted as proofs of this theory, and, of consequence, as evidence against the inorganic nature of manures. This class is usually denominated air plants; and, from their designation, would appear to feed on air alone. Analysis, however, has shewn that these plants resemble, in every respect, other vegetables; that they contain inorganic matter; and, so far as inference is legitimate, seem incapable of existing without inorganic food. Several spe-

cies have been analyzed in the Glasgow laboratory; one of these was the *Corallina Skinneria*. The analysis was conducted by my pupil, Mr John Thomson. Its composition was as follows:—

Water, . . .	79.64
Ashes, ...	2.02
Organic Matter,	18.34

The ashes, being analyzed, were found to consist of the following constituents:—

Silica, ...	8.43
Peroxide of Iron and Phosphates, ...	3.08
Alumina, ...	6.16
Carbonate of Lime, ...	40.62
Soluble Salts, consisting of Common Salt, Chloride of Potassium, Sulphate of Soda, containing 12.84 Sulphuric Acid, 3.36 Potash, 13.17 Soda, ...	42.72

We have thus presented to our notice another illustration of the apparently universal fact, that plants require inorganic matter as an essential element of their existence, and the inference becomes almost inevitable that, if its presence has been overlooked hitherto in any species of vegetable, careful examination will tend to carry out still further the important generalization.

Water incapable of dissolving much vegetable matter.—In connexion with the observations which have been previously made in opposition to the humus theory, I cannot omit to notice the inferences which appear to me deducible from a series of experiments in which I have for some time been engaged on the composition of various waters of Scotland, as they possess such a direct bearing in respect to the influence of dissolved vegetable matter in the nutrition of plants. Liebig, it is well known, in shewing the fallacy of the opinion respecting the influence of humus in the nutrition of plants, proves his point by a *reductio ad absurdum*. He admits, for the sake of argument, that humic acid is absorbed by plants in the form in which it could gain access in largest proportion, and then, from known data, demonstrates that the quantity absorbed in this way could only amount to the most minute fractional part of the weight of the plant. His reasoning is carried on principally by hypothetical instances; but the facts which I have obtained bear out, in a still stronger light, the position which he assumed. I have found that the waters of rivers which are perfectly clear, without being mixed with any perceptible colouring matter, and which have been drained from mosses, and have passed over deposits of vegetable matter in a state of decay, contain one part of vegetable matter dissolved in about 50,000 of water; while, on the other hand, when the waters were very dark coloured, and apparently contained as much vegetable matter in solution as they were capable of

taking up, the mean amount in solution was nearly one part in 25,000, while the largest quantity was one part in about 15,000 of water. In the latter cases it was evident that the water was saturated with the vegetable matter, because, after being subjected to evaporation for a very limited space of time, a deposit of vegetable flocks occurred; and this deposit was also apparent even after filtration, when the water was allowed to evaporate spontaneously. It is evident, therefore, in summer, when waters are clear, that, to communicate 1 lb. of solid vegetable matter, in a state of solution, to a plant, 50,000 times that weight of water would be required—a mode of supply of so slow and inefficient a nature, that but a small fraction of the organic elements of vegetables could be thus imparted. Liebig has supposed the case which he employs as an illustration of a much more favourable nature to the humus theorists. He admits humic acid to be soluble in 2,500 parts of water, on the authority of Sprengel, and humate of lime to be soluble in 2,000 parts of water, and shews that, in a particular case, to produce 2,650 lbs. of wood, 165 lbs. could only have obtained admission in the form of humic acid. This is the most favourable condition. It is scarcely necessary to advance that the results obtained by my experiments are still less in favour of the nutrition of plants by the admission of decomposing vegetable matter in solution to their vessels. Experiments have been made to ascertain how much organic matter could be taken up by water when allowed to digest in the latter. Mould has been treated with cold water, and it has been found that the water remained clear, and dissolved less than 100,000th part of organic matter. This amounts to about one-half the quantity of organic matter obtained as the result of the experiments previously alluded to.

Nature of the effect produced by steeping seeds.—When we are satisfied of the prominent position which inorganic matter assumes in the nourishment of plants, we are in some measure prepared to examine the effect resulting from steeping seeds in saline solutions. Virgil states that he had "seen many persons sowing seeds which had been previously sprinkled with carbonate of soda (nitrum) and black lees of oil, that the seminal produce might be enlarged."—(Georgic I., 193.)

> "Semina vidi equidem multos medicare serentes,
> Et nitro prius et nigra perfundere amurca;
> Grandior ut fetus siliquis fallacibus esset,"

which has been thus incorrectly translated by Dryden—

> "Some steep their seed, and some in caldrons boil,
> With vigorous nitre and with lees of oil,
> To swell the flattering husks with fruitful grain."

The ancients applied the term nitrum to carbonate of soda, and hence the term as employed by Virgil must be so understood. Such processes have long been employed by farmers, and are familiarly known by the terms brining and pickling. Jethro Tull tells us that brining, as an antidote to smuttiness, was discovered in the following manner, about the year 1660:—"A shipload of wheat was sunk near Bristol in autumn, and afterwards, at ebb, all taken up, after it had been soaked in sea water; but it being unfit for making of bread, a farmer sowed some of it in a field, and when it was found to grow very well, the whole cargo was bought at a low price by many farmers, and all of it sown in different places. At the following harvest, all the wheat in England happened to be smutty except the produce of this brined seed, and that was all clean from smuttiness. This accident has been sufficient to justify the practice of brining ever since in all the adjacent parts, and in most places in England." The same author gives the following process for brining wheat:—"The first thing is to make a very strong brine, (of pure salt,) and, when the wheat is laid on a heap, sprinkle it or lave it therewith; then turn it with a shovel, and lave on more brine; turn it again with a shovel, until, by many repetitions of this, the wheat be all equally wet. Next sift on quicklime through a sieve; turn the wheat with a shovel, and sift on more lime; repeat this sifting and turning many times, which will make it dry enough to be drilled immediately." He farther informs us that when lime has been long slaked—that is, when it has become carbonated—and is, therefore, incapable of extracting, from the surface of the seeds, the water which has been brought in contact with them in the form of brine, it is unfit for the purpose of preparing the brined seeds. Tull was, however, sceptical as to the influence of brining, for he says that smutty seed-wheat, though brined, will produce a smutty crop, unless the year prove favourable; and he conjectures that the Bristol wheat might have been foreign wheat, and from a locality where smut did not prevail.

A common idea entertained by farmers is, that smuttiness is principally confined to wet seasons; and this seems confirmed by the circumstance that we find no allusion to smut in the writings of Virgil, although, by a mistranslation, Dryden has made it appear that such a disease was known to the ancients. The original states, (Georgic I., 150):—

> "Mox et frumentis labor additus, ut mala culmos
> Esset robigo,"

which the poet translates—

> Soon was his labour doubled to the swain,
> And blasting mildews blackened all his grain."

The term in the original obviously relates to rust or blight, and not to smut; hence Dryden would have been nearer the mark if he had used reddened for blackened in the preceding translation.

If, therefore, as would appear from the absence of any notice of smuttiness by Virgil, this disease was unknown in an Italian climate, a powerful argument is supplied in favour of the idea held by farmers that smut is only produced in wet seasons, and the question whether brining is of any service in warding off this disease would still remain open for determination. The same remarks would apply to pickling wheat, so generally employed in the best agricultural districts. It is unnecessary to describe this familiar process, more especially as it has been so well detailed by Professor Low in his excellent work on agriculture. It is only proper to observe that the operation is of the same superficial nature as that of the brining previously noticed; and that the urine with which the seed is sprinkled must not gain access to the interior of the seed, otherwise deleterious effects will undoubtedly ensue. Tull seems to have been acquainted with the process of pickling—(he wrote about 1732)—and to have been quite aware that the injudicious employment of such operations is fraught with danger, for he says, "If seed-wheat be soaked in urine it will not grow, or if only sprinkled with it, it will most of it die, unless planted presently." Now all who have read the works of Tull with attention will agree that he was too accurate an observer to have made this objection to the common process of pickling if it had not been founded on fact. If we could suppose that the process of steeping were capable of conveying any nourishment to plants in their nascent state, it would be scarcely possible to employ a more efficient fluid than urine. But the operation of brining, which is popularly held to be efficient for preserving plants from the influence of smut and insects, would lead to the inference that the steeping of seeds has no connexion with the early nourishment of the plant, as we know that potash, and not soda, is the main constituent alkali in white wheat; and, indeed, according to the most recent analysis of this grain, soda appears to be entirely absent. As an answer to the argument that in steeping, the seed may absorb some salts which may afterwards serve as nourishment, we have only to imagine a turnip seed to be subjected to this operation, and then to endeavour to form a notion of the minuteness of the solid matter capable of being taken up by it from the solution in which it might have been immersed. From the evidence before us, it cannot be asserted that brining and pickling are of no practical value. The popular opinion in their favour rather supplies presumption in support of their employment. At the same time it must be confessed that their use is empirical, and that the recommenda-

tion of similar processes, which are in reality merely rude imitations, without affording any explanation of their mode of action, is to practise agriculture in a manner scarcely advisable in the present stage of its progress. We have learned from Tull, as we may from experience, that even the long established operations may prove prejudicial, and mar the object of the farmer, unless they are performed with caution and experience; and we may gather from his advice, that we should have the very best evidence presented to us, before tampering with the safety of our crops, to the detriment of the farmer and injury of the prosperity of the country.

There is a wide difference between the application of chemical principles and that of chemical substances in agriculture. True chemical principles, when rationally applied, must lead to correct results; but chemical substances may be used independently of such considerations, and the results to chemistry and to agriculture must be prejudicial. Agriculture and chemistry are experimental sciences. It is, therefore, necessary, if we expect to make progress in them, that experiments should be made. But, as in the laboratory, agricultural experiments should first be made on a limited scale, and their results carefully tested, before being submitted as facts to the agricultural world.

ACCOUNT OF THE HIGHLAND AND AGRICULTURAL SOCIETY'S GENERAL SHOW AT GLASGOW IN AUGUST 1844.

At the invitation of the counties of Lanark and Ayr, and adjoining counties, the Highland and Agricultural Society held their annual General Show at Glasgow on Wednesday, Thursday, and Friday, the 7th, 8th, and 9th of August 1844. From the great extent of the two named counties, and the undoubted wealth of the City and neighbourhood of Glasgow, high expectations were reasonably formed that this would be one of the largest and most valuable meetings, in regard to the amount of premiums and number of stock, that had ever yet taken place under the auspices of the Society, and we are happy to say that those expectations were fully realized. The Show itself proved the largest, and the amount of local subscriptions the greatest, of any meeting hitherto held. So large a number as 1453 head of stock, besides 357 lots of implements, were entered for exhibition; and no less a sum that £1600 were subscribed in the district for increasing and extending the number of premiums and objects of competition.

We observe, in the last report of the Council of the Royal Agricultural Society of England, that the Council congratulate themselves, and with reason, on the rapid increase of stock and implements that has taken place at their exhibitions—that at Derby the show-yard occupied twice the space of that of either Oxford or Cambridge, and contained nearly four times the number of animals, and more than seven times the number of implements at Oxford, as at their first meeting, five years' ago—and that the number of stock exhibited at Derby was 878 head, and 700 distinct implements. In a rich country such as England, containing 18,000,000 of inhabitants, possessing a youthful society numbering 7,000 members, such an increase, in so short a time, is a gratifying indication of the interest felt by agriculturists in the affairs of such a Society.

But, for a similar reason, should not the proceedings of our own venerable Society, consisting only of 2,000 members, and in a poor country such as Scotland, containing only 2,500,000 of inhabitants, afford much gratulation to its Directors, when the Show at Glasgow this year nearly doubled the large number of 778 head of stock, and more than trebled the number of implements—101—exhibited only in the last year at Dundee. Such a result may well be deemed unprecedented.

The ground appropriated by the Magistrates of Glasgow for the site of the Show, was a part of the Green, comprising what is called the King's Park, together with the Fleshers' Haugh. The King's Park forms a plateau of ground, at a slight elevation above, and separated by a belt of trees from, the flat area of the Haugh, which, at its extremity, forms a fine reach in the river Clyde. The King's Park is, besides, ornamented with several clumps of well-grown hard-wood trees, and is quite accessible by several beautiful drives.

The show-yard was fenced in, as usual, with a high boarded partition embracing the three sides of a rectangle along both the King's Park and Fleshers' Haugh, while the reach in the Clyde, along the Haugh, formed the barrier on the remaining side; and the area within the rectangle comprehended forty acres of ground. Clumps and belt of trees prevented the entire show-yard being seen from any particular point, but they served to diversify the ground into various areas, each possessing its own peculiar interest in the exhibition.

The live stock occupied the various areas into which the King's Park was thus naturally separated by the clumps of trees, while the implements were placed in an extensive circular line traced upon the Haugh. The stalls for horses and cattle were erected inside of the outer barrier, while the pens for sheep, swine, and poultry were judiciously distributed over the open

spaces of the ground. A long shed was erected in the Haugh within the circle of implements, for the exhibition of butter and cheese, and another of smaller dimensions, near to it, was appropriated to the exhibition of seeds and roots. A gallery for the accommodation of the ladies was constructed at a convenient spot adjoining one of the carriage drives. The stage upon which was exhibited the prize animals was erected a little in front of the gallery, while committee rooms, refreshment rooms, and marquees, ornamented with flags of various sizes and devices, were conveniently placed to suit their respective uses. A military band enlivened the scene by playing a number of popular pieces of music. The show-yard, when completely occupied, was certainly a beautiful piece of ground, and the arrangements altogether within it were calculated to afford satisfaction; but the pleasure of the scene was much impaired by the almost incessant fall of rain, accompanied with wind, and which made a memorable exception, being the first time for two and twenty years to the beautiful weather usually enjoyed at these annual meetings.

The business of the exhibition was divided over three days. On Wednesday the exhibition was confined to the inspection of, and awarding the premiums for, butter and cheese, and implements. The General Show took place on Thursday; and on Friday the stock and various articles that had obtained premiums were exhibited.

In regard to the exhibition of Wednesday, the display of butter and cheese, and of implements, was very extensive. There were in all 277 competitors in the various classes of butter and cheese, comprising 83 of cured butter, 101 of fresh butter, 54 of full milk cheese, made in 1844, 22 of full milk cheese, made prior to 1844, 14 of skim-milk cheese, and 3 of extra cheese.

The judges appointed to decide the premiums for butter and cheese were Professor Traill of Edinburgh University; Mr Francis Richardson, Edinburgh; Mr John M'Callum, Plewlands near Edinburgh; Mr Robert Thallon, and Mr Thomas Miller, Glasgow; and their awards were as follows:—

1. Butter.

Class I. To the owner of any Dairy in Scotland who shall have made and cured during the season 1844, and shall exhibit at the Show, the best quality of Cured Butter for the Market, the quantity made and cured not being less than two cwt. —Ten Sovereigns, to Mr John Watson, Nisbet, Lanarkshire.

For the second best quality—Seven Sovereigns, to Mr James Wilson, Auchalick, Argyleshire.

For the third best quality—Five Sovereigns, to Mr Alex. Buttery, Airdrie, Lanarkshire.

A Medal to Mr Alexander Aikenhead, Barskevein, Renfrewshire.

The judges commended the Cured Butter exhibited by Mr James Allison, Westfield, Renfrewshire; Mr John Brock, Barns of Clyde, Dumbartonshire; Mr John Craig, North Floors, Renfrewshire; Mr Robert Dall, Rickard ...

ston, Lanarkshire; Mr James Dun, Craigallan, Stirlingshire; Mr John Henderson, Glenhead, Perthshire; Mr John Morton, Baldutho, Fifeshire; and Mr David Shaw, Ladyland, Lanarkshire.

II. For the best Fresh Butter, to be exhibited in samples consisting of three ills of 1 lb. weight each, and by an individual from the farm of which it is the roduce—Three Sovereigns, to Mr James Maclean, Braidwood, near Edinburgh.

For the second best ditto—Two Sovereigns, to Mrs John Hunter, Beith, Ayrire.

For the third best ditto—One Sovereign, to the Duke of Montrose.

The judges commended the Fresh Butter exhibited by Mr James Allison, Westfield, Renfrewshire; Mr James Dun, Craigallan, Stirlingshire; Mr James Glen, Broadley, Renfrewshire; Mr William Hamilton, Pirsilands, Lanarkshire; Mr George Paton, Bankhead, Renfrewshire; Mr George Steel, Linziemill, Dumbartonshire; Mr Matthew Steel, Grahamshill, Lanarkshire; and Mr Robert Young, Bogtown, Lanarkshire.

2. Cheese.

III. To the person in Scotland who shall produce the best specimen of Sweet or 'ull Milk Cheese, made in 1844, of any variety that he shall find most profitable for ie Market, the quantity not being less than 2 cwt. of 112 lb., 16 oz. to the lb.—Ten overeigns, to Mr Gavin Rowat, Bonnanhill, Lanarkshire.

For the second best quality—Seven Sovereigns, to Mr Hugh Watt, Knocklandside, .ryshire.

For the third best quality—Five Sovereigns, to Mr James Wilkie, Craignethan, anarkshire.

The judges commended the Cheeses of this class exhibited by Mr James Allan, Braehead, Lanarkshire; Mr Hugh Borland, Wester Hillhouse, Ayrshire; Mr David Cunningham, Chapelton, Ayrshire; Mr William Cunningham, Law Farm, Ayrshire; Mr James Dunlop, Briar Bush, Ayrshire; Mr William Hamilton, Pirsilands, Lanarkshire; Mr John Jack, Hall of Kype, Lanarkshire; Mr James Newbigging of Poneil, Lanarkshire; Mr James Pollock, West Raws, Ayrshire; Mr John Ross, Titwood, Ayrshire; Mr William Simpson, Thirdpart, Ayrshire; Mr Robert Speir, Blairpark, Ayrshire; and Mr Alexander Wylie, Backside, Ayrshire.

IV. To the person in Scotland who shall produce the best specimen of Sweet or 'ull Milk Cheese, made previous to the year 1844, of any variety that he shall find nost profitable for the Market, the quantity not being less than 2 cwt. of 112 lb., 16 iz. to the lb.—Ten Sovereigns, to Mr William Kerr, Barroger, Aryshire.

For the second best quality—Seven Sovereigns, to Mr Hugh Borland, Wester Hillhouse, Ayreshire.

For the third best quality—Five Sovereigns, to Mr John Ross, Titwood, Aryshire.

The Cheese exhibited by the following competitors were commended by the judges:—Mr Walter Allan, Libberton, Lanarkshire; Mr James Cochrane, Brownside, Lanarkshire; Mr Robert Cunninghame, Kilkevan, Argyleshire; Mr John Jack, Hall of Kype, Lanarkshire; and Mr William White, Weston, Lanarkshire.

V. To the owner of any Dairy in Scotland who shall have made for sale, during the season 1844, the best quality of Cheese from Skimmed Milk, not being less than 2 cwt.—Five Sovereigns, to Mr William Hamilton, Pirsilands, Lanarkshire.

For the second best quality of ditto—Three Sovereigns, to Mr James Allan, Whitehill, Lanarkshire.

The specimens exhibited by Mr Robert Arthur, Pirleyhill, Stirlingshire, and Mr James Marshall, Goodorkhill, Lanarkshire, were commended.

In implements there were 156 competitors, exhibiting 357 articles. The premiums for implements were placed upon a different and improved footing this year from what they had hitherto stood at the General Shows, by being subdivided into

classes, of which there were 15, each bearing a distinct specification. Thus—

Class I. For the best collection of Agricultural Implements and Machines, of any description, manufactured by or under the superintendence of the Exhibitor, just proportion of parts, workmanship, utility, and price being considered, a Premium not exceeding Fifteen Sovereigns, and not under Ten Sovereigns. In this class were 19 competitors, exhibiting 157 articles.

The gentlemen appointed to decide upon the premiums for implements were Mr Campbell of Islay, Convener; Mr Dundas of Dundas Castle; Professor Traill of Edinburgh University; Mr Smith, late of Deanston; Mr Houldsworth; Mr Dalzel of Whitehouse Villa, Edinburgh; Mr Stirling of Glenbervie; and Mr Baird.

They awarded a Premium of Ten Sovereigns to Mr Robert Law, Shettleston, Glasgow, for the best collection; and Five Sovereigns to Mr James Wilkie, Uddingstone, for the best workmanship, &c.

Class II. For any new and useful Agricultural Implement or Machine, that has been satisfactorily tested in actual work, not previously exhibited in competition, a Premium not exceeding Ten Sovereigns, and not under Three Sovereigns. In this class were 16 competitors, exhibiting 21 articles. Premium of Seven Sovereigns was awarded to Mr Andrew M'Kerrow, Kilmarnock, for his antler plough; and Three Sovereigns to Mr John West, Lundie, for plough with apparatus for lifting potatoes.

Class III. For any Design, Model, or Drawing of any new Machine or Implement, applicable to any purpose connected with agriculture, though not tested by experiment, but which may, in the opinion of the judges, promise to be successful in accomplishing the object intended, a Gold or Silver Medal, as may be fixed on by the judges. Five competitors, with 5 articles, appeared in this class; but none were deemed worthy of a Premium.

Class IV. For any useful Improvement in the construction of Subsoil Ploughs, a Premium not exceeding Seven Sovereigns, and not under Three Sovereigns. There appeared 3 competitors, with 4 articles in this class, and the Premium of Five Sovereigns was awarded to Mr James Wilkie, Uddingstone, for his subsoil plough with improved share.

Class V. For any useful Improvement in the construction of the common Two-horse Plough, which has for its object the lifting and turning over the greatest possible quantity of the soil in a given time, with the least resistance to the draught, and which produces, at the same time, a fair and efficient surface for exposure to the air, or for seed, a Premium not exceeding Ten Sovereigns, and not under Five Sovereigns. There were 9 competitors, with 11 articles, in this class, and the Premium of Seven Sovereigns was awarded to Messrs Robert Gray & Sons, Uddingstone; and Three Sovereigns to Mr James Wilkie.

Class VI. For any useful Improvement in the construction of Barn Fanners, a Premium not exceeding Ten Sovereigns, and not under Three Sovereigns. Nine competitors, with 11 articles, appeared in this class, and the Premium of Five Sovereigns was awarded to Mr William Ralston, Malletsheugh, Renfrewshire.

Class VII. For any useful Improvement in Farm Carts and Wheels, a Premium not exceeding Ten Sovereigns, and not under Three Sovereigns. In this class there were entered 6 competitors, with 13 articles, and the Premium of Five Sovereigns was awarded to Mr Robert Crawford, Uddingstone.

Class VIII. For any useful Improvement in the Thrashing Machine, a Premium not exceeding Ten Sovereigns, and not under Three Sovereigns. In this class were 3 competitors, and 4 articles, and the Premium of Seven Sovereigns was awarded to Mr David Craig, Stewarton.

Class IX. For the most useful Improvement in the construction of any of the Implements used in the Cultivation of the Turnip and Potato crops—a Premium not exceeding Eight Sovereigns, and not under Two Sovereigns. There was very considerable competition in this class, there being 17 competitors, with 25 articles; and the Premium of Five Sovereigns was awarded to Mr James Wilkie, Uddingstone, for his Parallel Expanding Horse-hoe; Two Sovereigns to Mr Alexander Reid, Stewarton, for an improved plan of Drawing the Plough; and Two Sovereigns to Mr John M'Gill, Sundrum, Ayrshire, for an improved Horse-hoe and Grubber.

Class X. For the most useful Improvement in any of the Utensils or Machines used in Dairy Husbandry—a Premium not exceeding Seven Sovereigns, and not under Two Sovereigns. There were 7 competitors, with 7 articles; and the Premium of Five Sovereigns was awarded to Mr Robinson, Lisburn, Ireland; and Two Sovereigns to Mr Richmond, Salford.

Class XI. For the most successful introduction of any Machine or Implement that is generally approved of in the practice of Agriculture in England or elsewhere, or a modification of the same, and which hitherto has been but little known or employed in Scotland—a Premium not exceeding Ten Sovereigns, and not under Five Sovereigns; in which class there were 6 competitors, with 6 articles; and the Premium of Five Sovereigns was awarded to Mr William Crosskill, Beverley, for his patent Clod Crusher and Roller; and a Silver Medal to Mr Houston, Johnstone Castle, for Three Forks and Two Spades, forming simple and efficient implements for opening the subsoil and pulverizing the ground, manufactured by Mr William Taylor, Johnstone; and Ten Shillings to each of Two Men who shewed the use of these implements.

Class XII. For a Weighing Machine adapted to general Farm purposes, capable of weighing stock or produce, dead or alive, from the weight of a sheep to that of a loaded cart, and which will indicate an addition of 1000th part of the mass to be weighed—a Premium of Fifteen Sovereigns. There were 2 competitors, with no fewer than 5 articles, entered in this class; and a Premium of Five Sovereigns was awarded to Mr Thomas M'Cririck, Garallan.

Class XIII. For any improved method, whether patented or not, of Manufacturing Drain Tiles or Pipes, whereby the price will be reduced; the pipes or tiles to possess the requisite qualities of usefulness and durability, and satisfactory evidence as to the price to be produced—a Premium not exceeding Fifteen Sovereigns, and not under Seven Sovereigns. Five competitors, with 5 articles, appeared in this class; and the Premium of Ten Sovereigns was awarded to Mr F. W. Etheridge, Woodlands, Southampton.

Class XIV. Premiums and Medals for articles which do not come within the range of those above specified, to an amount not exceeding Twenty Sovereigns. As might have been expected, a great many, to the number of 26, competitors, with 54 articles, appeared in this varied class, and a number of small Premiums were awarded thus:—The Silver Medal to Mr John Anderson, Beedhill Tile-works, near Glasgow, for Tiles and Soles; the Silver Medal to Mr James Ferguson, smith, Bridge of Allan, for a Drain-Plough; One Sovereign to Mr Francis Taylor, wright, Leith, for a Safety Chain and Stool; the Silver Medal to Messrs W. & C. Young, Edinburgh, for an extensive collection, consisting of Wrought Iron Field-Gates, Carriage Gates, Hurdles, &c.; and Five Sovereigns to Mr Ebenezer Alexander, Taylorton, near Stirling, for a Cart with Machine for Spreading Lime.

Class XV. In this Miscellaneous class 20 competitors appeared, with 29 articles, to whom were awarded the following Premiums:—The Silver Medal to Sir John P. Orde of Kilmory, Bart., for a Gate and other articles; the Silver Medal to Mr John Crombie, Anderston, Glasgow, for a Model of a Brake; the Silver Medal to Messrs G. & J. Haden, St Andrew's Square, Edinburgh, for a patent Drying Machine; the Silver Medal to Dr George Wilson, Huntly, for a Movable Sheep Cot, with the thanks of the Society; the Silver Medal to Mr Murray, Garnkirk Works, for an assortment of Fire-Clay Vases, &c.; the Silver Medal to Henry J. Burn, Esq., Aberdour, Fifeshire, for Clay Pipes; the Silver Medal to Mr Moses Buchanan, Glasgow, for Two Millstones; the Silver Medal to Mr William M'Corkindale, Scone, for a Model of a Bark-Chopping Machine; the Silver Medal to Messrs Thomas and Archibald Wilson, for Two Kaimhill Millstones; the Silver Medal to Mrs Mary Cartmell, Liverpool, for an Oil-Cake Bruiser, and other implements; the Silver Medal to Mr James Kirkwood, Tranent, for a Coulter Cleaner; the Silver Medal to Mr Rolland, Watley Ralph, Halifax, for a full-sized Model of a Seed Separator, or Machine for Separating Rough Seeds from Grain; and Two Sovereigns to Mr Andrew M'Kerrow, Kilmarnock, for an improved hand Tile-Mould and Table.

In order to afford an opportunity to test the implements exhibited in Classes II. IV. V. and IX. by actual trial, two

fields were placed at the disposal of the Society, on a farm about five miles from Glasgow, one in which the various sorts of ploughs were tried, their construction examined, and force of draught ascertained by application of the dynamometer, and the other, already ploughed, after potatoes, was well suited to exhibit the action of drill-harrows and grubbers. In the former field was also shewn the use of the Trenching Forks, by the two workmen sent for the purpose by Mr Houston of Johnstone Castle, the result of the use of which implements is to retain the surface soil uppermost, while the subsoil is stirred thoroughly to the depth of 15 inches below the upper, and every large stone brought to the surface, and which are placed by the hand alongside the space subjected to trenching, ready for use in drains. The trial of implements took place on Tuesday the 6th of August, and occupied the greater part of the day.

By 8 o'clock on Thursday morning all the classes of stock were placed in their respective pens, ready for the inspection of the judges; and the names of the gentlemen appointed judges in the following Classes of Stock were—

Of Short Horns.—Mr William Bartholomew, Goltho, Lincolnshire; Mr John Wright, Romilly, Yorkshire; and Mr Heriot of Fellowhills, Berwickshire.

Of Ayrshire Cattle.—Mr John Buchannan, Finnich, Stirlingshire; Mr David Rennie, Corrie, near Kilsyth; Mr Robert Craig, Hatrick, Kilmalcom, in the First Section, and Mr Arthur Mather, Netherplace, Renfrewshire; Mr Alexander Wylie, Holme Byre, Dalry, and Mr Andrew Ayton, Fullerton, in the Second Section.

Of West Highland Cattle.—Capt. M'Niell of Colonsay; Capt. H. Stevenson; Mr Stewart of Achadashenaig; Mr Sinclair of Kilchamaig, Argyleshire; and Mr M'Lean, Glenfirslan.

Of the Polled Breeds of Cattle.—Mr Robert Carmichael, Raploch, Stirlingshire; Mr James Kennedy, Junior, Myremill; and Mr Fernie of Kilmux, Fifeshire.

Of Horses.—Colonel Graham, Mossknow; Mr Robert Watt, Closeburn; Mr Wm. Forrest, and Mr John Cairns, Glasgow; and Mr Wm. Strang, Auldhouse, Glasgow.

Of Leicester Sheep.—Mr John Buckley, Milnthorp, Lancashire; Mr John Grey, Dilston, Northumberland.

Of Black-faced Sheep.—Mr Lorne Campbell, Roseneath, Dumbartonshire, and Mr D. Macdonald, Craigruie, Argyleshire.

Of Southdown Sheep.—Mr John Dudgeon, Spylaw, Roxburghshire; Mr Campbell of Craigie, Ayrshire; and Mr Graham of Balgowan, Perthshire.

Of Cheviot Sheep.—Mr Pringle, Hawick; Mr Murray, Brockholes, Berwickshire; and Mr Black, Dalkeith Park, Mid-Lothian.

Of Swine.—Mr Grey, Dilston, and Mr Hunt, Thornington, Northumberland.

Of Alpacas.—Sir John P. Orde of Kilmory, Bart., Argyleshire.

Of Poultry.—Mr Crooks and Mr Cunningham, Glasgow, and Mr Chas. Muirhead, Edinburgh.

Of Roots and Seeds.—Professor Balfour of Glasgow University; Charles C. Babington, Esq., of Cambridge University; Dr Neill of Edinburgh; and John Inglis, Esq. of Redhall, Mid-Lothian.

The entire number of stock entered for exhibition upon which the judges had to adjudicate the premiums comprised 558 cattle, 210 horses, 568 sheep, 64 swine, 50 poultry, and 3 alpacas—in all, 1453 head. The cattle consisted of 124 bulls, 202 cows, 145 heifers, and 87 oxen; the horses of 32 stallions, 40 entire colts, 53

mares, 42 fillies, and 42 geldings; the sheep of 156 tups, 266 ewes, and 146 wethers; and the swine of 17 boars, 41 sows, and 6 pigs.

I.—Cattle.

Short-Horn.—It was not to be expected that a large exhibition of this species of stock would be presented in the west of Scotland; still 71 good animals were exhibited, consisting of 29 bulls, 15 cows, 19 heifers, and 8 oxen. The Premiums awarded them were the following:—

For the best Bull, calved after 1st January 1840—The Premium of Forty Sovereigns, to Mr John Hunt, Thornington, Wooler, for his bull, *Guy Faux.*

For the Second best ditto—Twenty-five Sovereigns, to John Millar, Esq. of Ballumbie, county of Forfar.

The Honorary Silver Medal, to Mr Crofton, Holywell, county of Durham, as the *Breeder* of the best Bull.

For the best Cow—Fifteen Sovereigns, to the Duke of Buccleuch, for his cow, *Duchess.*

For the second best ditto—Ten Sovereigns, to Sir Thomas Joseph de Trafford of Trafford Park, county of Lancaster.

For the best Heifer, calved after 1st January 1842—Ten Sovereigns, to W. R. Ramsay, Esq. of Barnton, M.P., for his heifer, *Jessamine.*

For the second best ditto—Seven Sovereigns, to Colonel Dalgairns of Balgavies, county of Forfar, for his heifer, *Queen of the Meadow.*

For the best Heifer, calved after 1st January 1843—Ten Sovereigns, to Mr Thomas Simson, Blainslie, county of Roxburgh, for his heifer, *The Queen.*

For the second best ditto—Seven Sovereigns, to Mr James Burnett, Aberlady, county of Haddington.

For the best two Oxen, calved after 1st January 1841—Fifteen Sovereigns, to Mr John Dudgeon, Musselburgh, county of Edinburgh.

For the second best ditto—Ten Sovereigns, to Mr Robert Dudgeon, Humbie, county of Linlithgow.

For the best two Oxen, calved after 1st January 1842—Ten Sovereigns, to Mr Robert Dudgeon, Humbie.

For the second best ditto—Seven Sovereigns, to Mr James A. Vernor, Hillhead, county of Edinburgh.

Ayrshire.—As Glasgow is the central point of the great district of the Ayrshire breed of cattle, the exhibition of this breed might reasonably have been expected to be great, and accordingly in number they amounted to 294. Of these 61 were bulls, 137 cows, 92 heifers, and 4 oxen. The Premiums awarded were as follows:—

For the best Bull, calved after 1st January 1840—Thirty Sovereigns, to Mr Robert Paton, Cloberhill, county of Dumbarton. The portrait of this very superior Bull was painted for the Society's Museum by Mr Gourlay Steell of Edinburgh.

For the second best ditto—Twenty Sovereigns, to Mr David Buchanan, Muckcroft, county of Lanark.

For the third best ditto—Ten Sovereigns, to Mr Alexander Miller, Highmains, county of Dumbarton.

The Honorary Silver Medal, to Mr William Brodie, Lochwinnoch, as the *Breeder* of the best bull.

For the best Bull, calved after 1st January 1842—Twenty Sovereigns, to Mr James Mather, Inches, county of Renfrew.

For the second best ditto—Ten Sovereigns, to Mr James Peattie, Knowhead, county of Stirling.

For the third best ditto—Seven Sovereigns, to Mr Robert Logan, Westmains, county of Ayr.

For the best Cow in Milk—Twenty Sovereigns, to Mr Lawrence Drew, Carmyle, county of Lanark.

For the second best ditto—Ten Sovereigns, to Mr William Peter, Temple, county of Dumbarton.

For the third best ditto—Seven Sovereigns, to Mr John Macadam, Ballindalloch, county of Stirling.

For the best Cow in Milk, calved after 1st January 1841—Ten Sovereigns, to Mr John M'Farlane, Blairnavaid, county of Stirling.

For the second best ditto—Five Sovereigns, to Mr Alexander Galbraith, Kilmannet, county of Stirling.

For the third best ditto—Three Sovereigns, to Mr Alexander Purdie, Millheugh, county of Lanark.

For the best three Cows in Milk, bred and reared by the Exhibitor—Ten Sovereigns, to Mr John Anderson, Gartnod, county of Lanark.

For the second best ditto—Five Sovereigns, to Mr William Hunter, Montfod, county of Ayr.

For the best three Cows in Milk, the same having been stall-fed, and had a calf at least six months previous to the 1st of August 1844. Their appearance as to Milk, and their condition as to Fat, to be taken into consideration—Ten Sovereigns, to Messrs Alexander M'Lachlan & Son, Gorbals, Glasgow.

For the best Heifer, calved after 1st January 1842, bred and reared by the Exhibitor—Ten Sovereigns, to Mr William Hay Boyd, Townend, county of Ayr.

For the second best ditto—Seven Sovereigns, to Mr William Paterson, Cairnbog, county of Stirling.

For the third best ditto—Five Sovereigns, to Mr John Waugh, Westside, county of Lanark.

For the best three Heifers, calved after 1st January 1842—Ten Sovereigns, to Mr Gabriel Dunlop, Peacock Bank, county of Ayr.

For the second best three ditto—Five Sovereigns, to Mr William Muir, Hardington Mains, county of Lanark.

For the best two Oxen, calved after 1st January 1840—Ten Sovereigns, to William Murray, Esq. of Polmaise, county of Stirling.

West Highland.—The near vicinity of Glasgow to the West Highlands would have warranted the expectation of a larger number of this breed than was presented, there only having been 80 animals, consisting of 16 bulls, 17 cows, 16 heifers, and 31 oxen. The Premiums were awarded thus :—

For the best Bull, calved after 1st January 1840—Thirty Sovereigns, to Mr Alexander G. Morrison, Salachan, Ardgower, county of Argyle.

For the second best ditto—Twenty Sovereigns, to William A. Campbell, Esq. of Ormsary, county of Argyle.

For the third best ditto—Ten Sovereigns, to Mr Alexander Cameron, Inverconerie Farm, county of Perth.

The Honorary Silver Medal, to Mr Alexander G. Morrison, as *Breeder* of the best bull.

For the best Bull, calved after 1st January 1842—Ten Sovereigns, to Messrs Stewart, Glenfinlass, county of Perth.

For the second best ditto—Seven Sovereigns, to the Marquis of Breadalbane.

For the third best ditto—Five Sovereigns, to the Marquis of Breadalbane.

For the best Cow, which has reared a calf during the season of the Show—Fifteen Sovereigns, to the Duke of Sutherland.

For the second best ditto—Seven Sovereigns, to Mr William Grant, Ruthven, county of Banff.

For the third best ditto—Five Sovereigns, also to Mr William Grant.

For the best three Cows, bred and reared by the Exhibitor, which have reared calves during the season of the Show—Ten Sovereigns, to the Marquis of Breadalbane.

For the best Heifer, calved after 1st January 1842, bred and reared by the Exhibitor—Seven Sovereigns, to Mr Donald M'Laren, Glenertnay, county of Perth.

For the second best ditto—Five Sovereigns, to the Marquis of Breadalbane.

For the best three Heifers, calved after 1st January 1842—Seven Sovereigns, to the Marquis of Breadalbane.

For the second best three ditto—Five Sovereigns, to Neill Malcolm, Esq. of Poltalloch, county of Argyle.

For the best two Oxen, calved after 1st January 1840—Ten Sovereigns, to Archibald Stirling, Esq. of Keir, county of Perth.

For the second best two ditto—Five Sovereigns, to Neill Malcolm, Esq. of Poltalloch.

For the best two Oxen, calved after 1st January 1841—Ten Sovereigns, to Archibald Stirling, Esq. of Keir.

For the second best two ditto—Five Sovereigns, to Archibald Stirling, Esq. of Keir.

For the best two Oxen, calved after 1st January 1842—Ten Sovereigns, to Neill Malcolm, Esq., of Poltalloch.

For the second best two ditto—Five Sovereigns, to Mr Donald M'Laren, Glenertnay, county of Perth.

For the best two Oxen, calved after 1st January 1841, which have not been housed or confined in a strawyard since Whitsunday 1842—Ten Sovereigns, to the Duke of Sutherland.

For the best five Oxen, calved after 1st January 1843, bred and reared by the Exhibitor—Ten Sovereigns, to Mr Donald M'Laren, Glenertnay, county of Perth.

Galloway, Angus, and Aberdeen Polled—Fife—Any Breed, and Crosses.—Of these various denominations of cattle only 23 animals were exhibited, consisting entirely of oxen, for which class only Premiums had been offered, and they consisted of 16 of the Polled, 2 of the Fifeshire breed, 2 of Any breed, and 3 of Crosses. The Premiums for them were thus awarded :—

For the best two Polled Oxen, calved after 1st January 1840—Fifteen Sovereigns, to Mr Robert Lyall, Old Montrose, county of Forfar.

For the second best two ditto—Ten Sovereigns, to James M'Douall, Esq., of Logan, county of Wigton.

For the third best two ditto—Five Sovereigns, to James M'Douall, Esq., of Logan.

For the best two Oxen, calved after 1st January 1841—Fifteen Sovereigns, to Mr John Collier, Panlathy, county of Forfar.

For the second best two ditto—Ten Sovereigns, to Mr Robert Lyall, Old Montrose.

For the best two Fife Oxen, calved after 1st January 1840—Ten Sovereigns, to Mr David Wallace, Balgrummo, county of Fife.

For the best two Oxen of Any Breed, pure or cross, calved after 1st January 1840—Fifteen Sovereigns, to Archibald Stirling, Esq., of Keir.

For the best Ox, pure or cross, calved after 1st January 1840—Ten Sovereigns, to Mr William Christie, Markle, county of East Lothian.

For the best Dairy Cow—Ten Sovereigns, to Mr Lawrence Drew, Carmyle, county of Lanark.

For the second best ditto—Five Sovereigns, to Mr John Brock, Barns of Clyde, county of Dumbarton.

II.—Horses.

Of the 210 horses, there were, for purely agricultural purposes, 23 stallions, 40 entire colts, 46 mares, 40 fillies, and 37 geldings. The Premiums were awarded thus :—

For the best Cart Stallion for Agricultural purposes, not exceeding eight years old—Forty Sovereigns, to Mr Samuel Clark, Mansurie, county of Renfrew.

For the second best ditto—Twenty-five Sovereigns, to Mr Robert Park, C shinnoch, county of Renfrew.

For the third best ditto—Fifteen Sovereigns, to Mr Robert Bowie, Gilmedl county of Stirling.

For the best Draught Mare for Agricultural purposes—Twenty-five Soverei to Mr John M'Farlane, Blairnavaid, county of Stirling.

For the second best ditto—Fifteen Sovereigns, to Mr John Bartholomew, Br hill, county of Dumbarton.

For the third best ditto—Seven Sovereigns, to Mr Robert Murdoch, East Ha head, county of Lanark.

For the best Brood Mare, having had a foal in 1844—Ten Sovereigns, to Andrew Stewart, Kennyhill, county of Lanark.

For the second best ditto—Five Sovereigns, to Mr Alexander Galbraith, C cunningham, county of Stirling.

For the best entire Colt for Agricultural purposes, foaled after 1st January 1 —Fifteen Sovereigns, to Mr John Erskine, Burntshields, county of Renfrew.

For the second best ditto—Seven Sovereigns, to Mr Thomas Bowman, Hal county of Lanark.

For the best ditto, foaled after 1st January 1842—Ten Sovereigns, to Mr Matt Young, Knockendale, county of Ayr.

For the second best ditto—Five Sovereigns, to Mr John M'Farlane, Blairna county of Stirling.

For the best ditto, foaled after 1st January 1843—Five Sovereigns, to Mr Tho Bowman, Hallhill.

For the best Gelding for Agricultural purposes, foaled after 1st January 18 Ten Sovereigns, to Mr Matthew Young, Knockendale.

For the best Filly for Agricultural purposes foaled after 1st January 18 Fifteen Sovereigns, to Mr William White, Weston, county of Lanark.

For the second best ditto—Seven Sovereigns, to Mr John Anderson, Gart county of Lanark.

For the best ditto, foaled after 1st January 1842—Ten Sovereigns, to Mr Wil Muir, Hardington Mains, county of Lanark.

For the second best ditto—Seven Sovereigns, to Mr Robert Findlay, Spring county of Lanark.

For the best ditto, foaled after 1st January 1843—Five Sovereigns, to Mc Robert and Thomas Jackson, Stanley Muir, county of Renfrew.

For the best pair of Horses or Mares, of any age, adapted for Agricultural poses—Ten Sovereigns, to Mr Andrew Wallace, Torryglen, county of Lanark.

For the second best pair of ditto—Five Sovereigns, to David Robert C. Bucha Esq. of Drumpellier, county of Lanark.

For the best two Cart Horses or Mares, the same having been in the posse of the Exhibitor, and chiefly worked upon the streets of Glasgow, anywhere wi the Parliamentary boundaries, for one year previous to the Show, to be exhil in the Harness in common use for the preceding month, and by the Driver— Sovereigns, to Mr William M'Culloch, Glasgow.

For the second best ditto—Five Sovereigns, to Messrs John Bartholomew & Glasgow.

The Silver Medal to each of the Drivers of said Horses.

For the best Cart Horse or Mare, the same having been in possession o Exhibitor, and driven by himself chiefly upon the streets of Glasgow, anyw within the Parliamentary boundaries, for one year previous to the Show, to be bited in the Harness in common use during the preceding month, and b Owner—Ten Sovereigns, to Mr Matthew Smellie, 221 Argyle Street, Glasgow

III. Sheep.

Blackfaced.—Of this breed of sheep there were 246 exhib consisting of 46 tups, 105 ewes, and 95 wethers; and the miums awarded to them were as follows:—

For the best three Tups, not exceeding forty-five months old—Fifteen Sovereigns, to Mr David Foyer, Knowhead, county of Stirling.

For the second best three ditto—Ten Sovereigns, to Mr William Gillespie, Gateside, county of Lanark.

For the third best three ditto—Five Sovereigns, to Mr Thomas Gillespie, Parkhall, county of Lanark.

For the best pen of five Ewes, not exceeding five years and seven months old, selected from a regular breeding Stock of not fewer than a hundred, and the pen having reared Lambs for three months during the season previous to the Show—Ten Sovereigns, to Mr William Gillespie, Gateside.

For the second best pen of five ditto—Five Sovereigns, to Mr David Foyer, Knowhead.

For the best pen of five Gimmers—Ten Sovereigns, to Mr David Foyer, Knowhead.

For the second best pen of five ditto—Five Sovereigns, to Mr John Watson, Nisbet, county of Lanark.

For the best pen of five Dinmonts—Ten Sovereigns, to Mr Thomas Murray, Brenchoilly, county of Argyle.

For the second best pen of five ditto—Five Sovereigns, to Mr Malcolm Coubrough, High Craigton, county of Dumbarton.

For the best pen of five Tup Lambs—Seven Sovereigns, to Mr William Gillespie, Gateside.

For the second best pen of five ditto—Five Sovereigns, to Mr David Foyer, Knowhead.

For the best pen of five Wether Sheep, not exceeding three years old—Five Sovereigns, to Mr John Phillips, Laighpark, county of Dumbarton.

For the best pen of five Wethers, not exceeding three years old, fed exclusively on hill pasture since twelve months old—Five Sovereigns, to Mr David Scott, Northfield, Mid-Lothian.

For the second best pen of five ditto—Three Sovereigns, to Mr Malcolm Coubrough, High Craigton.

For the best pen of five Wethers, of any age, shewing most symmetry, fat, and weight—Five Sovereigns, to Mr David Scott, Northfield.

For the second best pen of five ditto—Three Sovereigns, to Mr John Phillips, Laighpark.

For the best pen of five Ewe Lambs—Seven Sovereigns, to Mr Wm. Gillespie, Gateside.

For the second best pen of five ditto—Five Sovereigns, to Mr David Foyer, Knowhead.

Cheviot.—There were 82 exhibited, consisting of 32 tups, 40 ewes, and 10 wethers; and the Premiums were thus awarded:—

For the best two Tups—Ten Sovereigns, to Sir Graham Montgomery of Stanhope, Bart., county of Peebles.

For the second best two ditto—Seven Sovereigns, to Mr Alexander Murray, Hearthstone, county of Peebles.

For the third best two ditto—Five Sovereigns, to Mr James Brydon, Moodlaw, county of Dumfries.

For the best Shearling Tup—Seven Sovereigns, to Mr Alexander Craig, Bighouse, county of Sutherland.

For the second best ditto—Three Sovereigns. also to Mr Craig.

For the best pen of five Ewes—Seven Sovereigns, to Sir Graham Montgomery of Stanhope, Bart.

For the second best pen of five ditto—Three Sovereigns, to Mr Alexander Craig, Bighouse.

For the best pen of five Gimmers—Seven Sovereigns, to Mr James Brydon, Moodlaw.

For the second best pen of five ditto—Three Sovereigns, to Mr Alexander Denham, Baitlaws, county of Lanark.

Leicester.—Of these 99 were exhibited, consisting of 39 tups and 60 ewes, and the award of the Premiums was as follows:—

For the best Tup, not exceeding forty-five months old—Ten Sovereigns, to Mr William Smith, Burton, county of Northumberland.

For the second best ditto—Five Sovereigns, to Mr John Wallace, Banbeath, county of Fife.

For the best pen of three Ewes of any age—Five Sovereigns, to Mr Hugh Watson, Keillor Farm, county of Forfar.

For the best pen of three Tup Lambs—Three Sovereigns, to Mr John Brodie, Abbey Mains, county of Haddington.

For the best pen of three Ewe Lambs—Three Sovereigns, to Mr John Brodie, Abbey Mains.

Southdown.—In all 64 were exhibited, consisting of 12 tups, 40 ewes, and 12 wethers; and the Premiums for them were thus awarded :—

For the best Tup—Fifteen Sovereigns, to the Duke of Richmond.

For the second best ditto—Ten Sovereigns, to Mr Hugh Watson, Keillor Farm, county of Forfar.

For the best pen of Five Ewes—Ten Sovereigns, to the Duke of Richmond.

For the second best ditto—Five Sovereigns, to Mr Hugh Watson, Keillor Farm.

Crosses.—There were 15 dinmonts and wethers of cross breeds exhibited, and the only Premium awarded was—

For the best pen of five Dinmonts, a cross between the Leicester Tup and Black-faced Ewe—Five Sovereigns, to the Duke of Montrose.

Alpacas.—The honorary Silver Medal and Five Sovereigns were awarded to Mr A. Gartshore Stirling of Craigbarnet, county of Stirling, for a pair, male and female, with their young one. They were all of black colour. We regret to learn that the young one has died since the date of the Show.

IV. Swine.

Of competing animals of this class there were 15 boars, 40 sows, and 6 pigs; and the Premiums for these were awarded thus :—

For the best Boar, large breed—Four Sovereigns, to William Campbell, Esq. of Ederline, county of Argyle.

For the second best ditto—Two Sovereigns, to Mr Walter Burnside, New City Road, Glasgow.

For the best Sow, large breed, in pig or milk—Four Sovereigns, to Mr Robert Hewitson, Auchenbenzie, county of Dumfries.

For the second best ditto—Two Sovereigns, to Mr Colin Campbell of Colgrain, county of Dumbarton.

For the best Boar, small breed—Four Sovereigns, to Mr John Bartholomew, Broomhill, county of Dumbarton.

For the second best ditto—Two Sovereigns, to Mr James Burnett, Aberlady, county of Haddington.

For the best Sow, small breed, in pig or milk—Four Sovereigns, to Mr Hope Hunter, Craighead, county of Lanark.

For the second best ditto—Two Sovereigns, to North Dalrymple, Esq. of Cleland, county of Lanark.

V. Poultry.

Of this class of useful stock, notice of which has only been taken at these meetings for the last few years, 44 were exhibited in competition, consisting of 2 turkeys, 18 fowls, 12 ducks, and

[?] geese, and the Premiums were awarded to the respective [?]nds as follows :—

For the best couple of Turkeys, of the black breed—To the Duke of Montrose, [th]e Premium of Two Sovereigns.

For the best couple of Fowls of the mottled or speckled Dorking breed—To the [Du]ke of Montrose, the first Premium of One Sovereign.

For the second best couple of ditto—To Lord Blantyre, the second Premium of [Ha]lf-Sovereign.

For the best couple of Fowls of the Polish breed—To William Lockhart, Esq., Milton Lockhart, M.P., the Premium of One Sovereign.

For the best couple of Fowls of the Spangled Hamburg, or old breed of Scotland [—]To Mr Alexander Smith, Glenhutch, county of Edinburgh, the first Premium of [On]e Sovereign.

For the second best ditto—To Mr David Buchanan, East Muckcroft, county [of] Lanark, the second Premium of Half-Sovereign.

For the best couple of Ducks—To the Duke of Montrose, the first Premium of [On]e Sovereign.

For the second best ditto—To Lord Blantyre, the second Premium of Half-[So]vereign.

For the best pair of Geese—To Mr William Sadler, Norton Mains, near Edin[bu]rgh, the first Premium of One Sovereign.

For the second best ditto—To William Campbell, Esq., of Ederline, the second [Pre]mium of Half-Sovereign.

VI. Extra Stock.

Besides the stock just detailed, and which were entered in [co]mpetition for stated premiums of their respective classes, there [we]re presented for exhibition as Extra Stock—which are only [en]titled to honorary premiums—164 animals, comprising 69 [ca]ttle, 24 horses, 62 sheep, 3 swine, and 6 head of poultry.

Cattle.—Of these in this class were exhibited 18 bulls, 12 [co]ws, 18 heifers, and 21 oxen, and the following were com[m]ended :—

A year-old Ayrshire bull, belonging to Mr John Anderson, Gartnod, Lanarkshire. [A] year-old Ayrshire bull, belonging to Mr Robert Kirkwood, High Langmuir, [Ay]rshire. A two-year-old Ayrshire bull, belonging to Mr John Buchanan, [?]nnich, Stirlingshire. A two-year-old Ayrshire heifer, belonging to Mr R. Kirk[wo]od, High Langmuir. A year-old Ayrshire heifer, belonging to Mr James Young, [?]andaxwood, Mid-Lothian. Two three-year-old Ayrshire cows, belonging to Mr [Th]omas Stevenson, Beith, Ayrshire. A two-year-old Ayrshire cow in milk, belong[in]g to Mr William Hay, Orchardton, Dumbartonshire; and three aged Ayrshire [co]ws belonging to Mr Robert Kirkwood, High Langmuir. Mr Stevenson's, Mr [H]ay's, and Mr Kirkwood's cows were most commended. Of Highland cattle there [we]re commended of great merit two five-year-old stots, belonging to Mr Stirling of [K]eir, and a four-year-old stot belonging to Mr Gilchrist of Ospisdale in Perthshire.

Horses.—Of which were exhibited in this class 10 stallions, [in]cluding a fine Gaza Ass, belonging to Mr Thomas Gowans, [?]ddenbrae Mill, Mid-Calder, county of Mid-Lothian, 7 mares, [?] fillies, and 5 geldings, and the following were commended :—

The Earl of Galloway's four-year-old entire colt, *Poxton* by *Reveler*, out of a [co]aching mare; Captain Barstow's Arab, an entire horse of high caste, aged nine [ye]ars; Mr Cowan's, of Dalkeith, entire horse, *Stranger*, by Quicksilver, five years [ol]d; and Mr Hugh Wallace's, Rhinmuir, Lanarkshire, stallion for agricultural pur[po]ses, aged nine years.

Sheep.—Of the 62 animals constituting this class 27 were

tups, 21 ewes, and 14 wethers, and the following were commended :—

Five ewe-lambs belonging to Mr J. L. Stewart of Glenbuckie, Argyleshire, and 2 wethers belonging to D. Campbell, Esq., younger of Sonachan, as being remarkable, inasmuch as they were stated to have attained the extraordinary age of 21 years 3 months. Two aged Leicester tups, belonging to Mr George Brown, Balls, East Lothian, and a lot of 6 shearling Leicester tups, belonging to Mr William Sanderson, Burton, Northumberland. A Southdown shearling tup and 3 gimmers, belonging to the Duke of Richmond, and 5 gimmers, a cross between a Southdown tup and Blackfaced ewe, belonging to North Dalrymple, Esq., of Cleland, county of Lanark.

Swine.—A large sow of the Chinese breed, belonging to Mr William Dobbie, Lennoxmores, Stirlingshire, was commended.

Poultry.—A cross between the Muscovy Drake and common Duck, belonging to William Campbell, Esq. of Ederline, Argyleshire, and the Duke of Montrose's Spanish fowls were commended.

VII.—Roots and Seeds.

Owing to the Show taking place at so early a season in the year, the exhibition of Seeds and Roots was not so extensive as it would otherwise have been. The articles exhibited were, however, generally interesting, and many of them deserving of particular notice. The judges in an especial manner called attention to the excellent series of specimens exhibited by Messrs Lawson and Son of Edinburgh, Seedsmen to the Highland and Agricultural Society. These consisted of a collection of 54 species and varieties of grasses, and other herbage plants, illustrative of their Treatise on the Cultivated Grasses; a very complete collection of the cereal plants in straw; a growing plant of the Guinea grass, well fitted for countries subject to excessive drought; a new African grass like millet; besides several new varieties of barley from Abyssinia; a new Hungarian species of clover, as well as other interesting specimens. Mr Stirling of Glenbervie exhibited two boxes, shewing a result of experiments with grass seeds, with the view of ascertaining the depth at which those ordinarily cultivated should be sown. Among the remaining articles of the exhibition, the judges directed attention to a series of specimens exhibited by Mr James Campbell of Dundee, consisting of various grains raised from seed steeped in fertilizing liquids. These were contrasted with others which had not undergone the process, and were in all cases decidedly superior. Of the Rye-grass seed the judges considered that cultivated by Mr Alexander Watt, Fenwick, as the best. The collection of various sorts of grains and seeds exhibited by Messrs Dryshill and Co., nurserymen, Glasgow; by Mr John M'Naughton, gardener to John Wauchope, Esq. of Edmonston; and by Mr John Jamieson, Straiton, Mid-Lothian, were highly creditable. The judges also noticed the excellent specimens of roots and vegetab es exhibited by Mr Davidson, gardener; Messrs W. and J. Noble of London; Messrs Austin and M'Aslan of Glasgow; and Mr William Lambert of Crichton Cottage, Peebles.

After enumeration of the awards of the Premiums it may be interesting to peruse the pedigrees of such of the Short-horn bulls, cows, and heifers, in the competing classes, as were communicated by the exhibitors :—

Of Bulls calved after 1st January 1840.

The Earl of Stair's *Viscount*, **got by the Baron, dam Diana, by Monarch, (Barclay of Ury,)** g d Mayflower, by Invalid, (Barclay,) g g d Rosebud by St Leger, 1420, g g g d by Comus, g g g g d by Denton, 198, g g g g g d by Henry, 301.

Mr Bruce of Kennet's *Rennie*, got by Newton, 2367, dam Phantassie, by Champion, 865, g d Marcia, by Mars, 44, g g d by Jupiter, 341, g g d by Alfred, 23.

Mr Buchanan's *Duke of Wellington*, got by Camillan, dam Ellen, bred by Mr Grey of Millfieldhill, Northumberland; Camillan got by Tonio, d Cowslip, by Miner, 2137, g d by Duke of Wellington, g g d by Alexander, 21, g g g d by Bolingbroke, 86; Ellen, got by Archibald, 1652, bred by Earl Spencer.

Mr Drummond's *Pirate*, dam Daisy, sire Red Rover, d Barclay by Invalid, g d Marcia, by Mars, sire Hercules, by Sirius, d Red Rose, by Wellington.

Mr Lindsay Carnegie of Boysack's *Sir Robert Peel*, got by Mr Bate's Nonsuch, dam Beeswing, by Commodore, 1858, g d by Turnell Major, g g d Turnell Major got by Mr Grant's Old Major, Nonsuch, by Short Tail, 2621, d Nonsuch the 2d, by Belvidere, 1706, g d Nonsuch, by Magnet, 2240, g g d by Major, a son of Minor, 441, g g d Old Sally, by a grandson of Favourite, 252, g g g g d by Punch, 531, g g g g g d by Hubback, 319.

Mr Lindsay Carnegie's *Henry*, got by Newton, dam Rachel, by Eclipse, 1949, g d by Attratum, Attratum by Attraction, 1661, g g d by Mr Charles Colling's Young Favourite, 254, Newton, got by a grandson of Colling's Minor, d by Robert, Colling's Major, g d by Charles Colling's Yarboro', g g d own sister to Old Red Rose, by Favourite.

Mr Grant Duff of Eden's *Sir Thomas Fairfax the Second*, 6493, by Sir Thomas Fairfax, 5196, son of Norfolk, 2377, grandson of Second Hubback, 1423, dam Jane, by Young Barmpton, (by young Eryholme, 1981,) his dam by Blucher, own brother to Belvidere, 1706, g d Polyanthus, by Eclipse, 238, son of Barmpton, 54, g g d Primrose, (Herd-Book, vol. i. p. 568,) by Billy, (vol. i. p. 572,) g g g d by Western Comet, 689, g g g g d Best Twin, by Favourite, 252, g g g g g d (bred by Mr Charge,) by Simmon, descended from the famous Studley white bull.

Mr Forrest of Stretton's *Frederick*, got by Symmetry, 5389, dam Rally, by Magnum Bonum, 2243, g d Red Rose, by Forrester, 1011, g g d Rachel, by Frederick, 1060, g g g d by Planet, 502, g g g g d by Comet, 155.

Mr Fleming of Barochan's *Comet*, dam Lillie, by Young Emperor out of Carnation, by Captain Barclay's Emperor, g d Susan, by Champion, g g d Lucy, by Mars, 411, g g g d by brother to Whitworth, 695. Lillie out of Miss Jollie, by Mr Boswell's Balmuto, who was out of a cow of Mr Mason of Chilton, by Mr Ferguson's Yankee Doodle.

Mr Geekie of Baldowrie's *Strathmore*, 6547, by Roan, 2 years old, by the Baron, 5095, d Diana by Monarch, 4495, g d Mayflower, by Invalid, 4076, g g d Rosebud, by St Leger, 1420, g g g d by Comus, 3455, g g g g d by Denton, 198, g g g g g d by Henry, 301.

Mr Graham of Kincaldrum's *Ury*, by Mahommed, dam Juno, by Saturn, g d Isabella, by Silkworm, g g d Bright Eyes, by Broklesby, g g g d Careless, by Colne, g g g g d Miss Cresswell, by Ketton, g g g g g d Reasby.

Mr Grey of Milfield Hill's *Prince of Wales*, 4833, got by Tertius, 5415, d Victoria, by Lord Spencer's Archibald, 1652, g d Britannia, by Kirkharle, 2178, g g d by Duke of Wellington, 231, g g g d by Yarborough, 705, g g g g by Traveller, 655, g g g g d out of the old Favourite cow by Bolingbroke, 86.

Mr Hogarth's *Trojan*, by Fergus, dam Helen, by Fop, g d by Cassandra, by Dandy, 1902, g g d by Rufus, 2576, g g g d by Wetherell's Wellington, 678, g g g d Countess, g g g g g d by Mr Allison's grey bull, 26.

Mr Binning Home's *Landlord*, by Reformer 2d, dam Lucy, by Elford, g d Lucy,

by Shidlaw white Bull, g g d by Richmond, 1380, d Young Maria, by Hay..., g g g d Old Maria, by a bull from Mr Charles Collings.

Mr Hood's *Sir David*, got by Bowmount, dam by Young Bachelor, g d by Robin Hood, g g d by Eclipse, &c. Bowmount was got by Magnum Bonum the 2d, dam by a grandson of Borderer, g d by Edrom, &c. Robin Hood was got by Cleveland, dam by Diamond, g d by Wellington, &c.

Mr Hunt's *Guy Faux*, got by Gainford, dam by Matchem the Third, g d by St Alban's, g g d by Simon, g g g d by Pope, &c.

Mr Millar of Ballumbie's Bull, got by Gainford, 2044, dam Beresina, by Cripple, 1967, g d Brilliant, by Snowdrop, 2653, g g d by St Alban's, 1412, g g g d by Wemley, 2819, g g g g d by R. Colling's Washington, 676.

Mr Milne Faldonside's *Ethelred*, got by the Earl, dam Emily, by Comet, ..., g d by Eclipse, 1949, g g d Elvira, by Duke, 1933, g g g d by Wellington, ..., g g g g d by Young Remus, 2522, g g g g g d by Midas, 435, g g g g g g d by Traveller, 655, g g g g g g g d by Bolingbroke, 86. The Earl by Gainford, 2044, dam Marchioness, by Eclipse, 1949, g d Countess, by Sir Charles, 593, g g d Princess, by St Alban's, 1412. &c.

Mr Sadler's *Radical*, got by Mr Howey's Bowmount, dam Nanny, by Reformer, 2507, g d by Ewart, 1987, g g d by Neptune, Bowmount by Borderer, ..., his dam by Mr Hood's Reformer, 2502, g d by Sundon, 1462, g g d by Northern Light, ..., g g g d by Mr Hunt's Countess, by Yorkshireman, 2862 (a son of Mr R. Colling's Minor,) g g g g d Mr Wetherell's Wellington, 1678, g g g g g d by Mr Maynard's Eryholme of Eryholme, g g g g g g d by Mr James Brown's red Bull.

General Sharpe's *Trump*, 5511, got by Capt. Barclay's *Pedestrian*, 4670, dam Adelaide, bred by Captain Barclay, by Commander, 3439, g d Rose, alias ..., by Satelite, 1420, g g d by Baronet, 60, g g g d by Cleveland, 144, g g g g d by Symmetry, 641.

Mr Stewart of Southwick's *Fitzmaurice*, 3807, got by Sir Thomas Fairfax, ..., dam Lady Mary, by Mercury, 2301, g d Lauriestina, by Grazier, 1083, g g d Miss Cropper, by Rob Roy, 557, g g g d by Barmpton, 54, g g g g d by Expectation, ...

Mr Turnbull's *Young Keir*, by Old Keir, sire of Old Keir, Young Hercules, dam Whisky, g d Young Countess, by Waverley, 1108, Young Hercules by Hercules, bred by Mr Smith of Shidlaw, d of Young Keir, Young Tuberose, g d Tuberose, 619.

Mr White's Bull, got by Bloomsbury, dam by Fenwick, g d by Tillside, g g d by Radical, g g g d by Togston, g g g g d by Mr Riddel's roan Bull, g g g g g d by Henry, 301, g g g g g g d by Irishman, 329.

Of Cows.

The Duke of Buccleuch's *Duchess*, got by Thorp, (see Herd Book,) dam Kilmeny, by Matchem, g d by a son of Mr Colling's George, g g g d by Windyard.

The Duke of Buccleuch's *Eliza*, got by General Picton, dam Snowdrop.

Mr Dalgairn's *Young Lady*, got by Belvidere the Second, dam Lady, by Waterloo, 2816, g d by Kitt, g g d by Kitt, g g g d by Mr Page's Bull, g g g g d by Mr Middleton's Bull.

Mr Furme's Cow, got by Sir Walter, dam by son of Mr Booth's Jerry, g d Young Star, g g d Rosebery.

Mr Binning Home's *Second Nell*, (and twin Queys by Septimus,) by Borderer, dam Old Nell, by a son of Chilton, d by Northern Light, 1280, g d by Tweedside, g g d Old Lanton.

Mr Binning Home's *Norah Third*, by Reformer Second, dam Nell Second by Borderer, &c.

Mr Millar's *Countess Matilda*, got by the Knight, dam Silverlocks, by Young Mars, g d by Mr Stephens' Bull, Brown, g g d by Mr Robertson's Valentine, g g g d bred by Mr Mason of Chilton.

Mr Ramsay's *Lavender*, got by Ranunculus, 2479, dam Clara, by Ratify, 2611, g d by Umpire, 2783.

Mr Reid's Cow, got by Favourite, dam by Whisker, g d by Romulus, g g d by Charles the Second, g g g d by Baron, g g g g d by Alfred.

Mr Smith's *Nell First*, by Borderer, dam Old Nell, by a son of Chilton, g d by Northern Light.

Of Heifers—Two-years-old.

Mr Burnet's Heifer, got by a Bull of his own, which was got by Mr Carnegie's Bull, (New Edrom,) a grandson of Archibald, bred by Lord Althorp, and brought to Northumberland by Mr Grey, &c.; her dam was by Pilot, g d by North Star.

Colonel Dalgairn's *The Queen of the Meadow*, got by Mahommed, dam Jane; by Reformer, 2509, g d by Raby, 2474, g g d by Neesham, 1261, g g g d by Marske, 418.

Colonel Dalgairn's *Lady Bird*, got by Mahommed, dam Adeline, by Plenipo, g d Ada, by Juniper, g g d Eve, by Retton, g g g d Big Bett.

Mr Milne's *Isabella*, got by the Earl, dam Carnation, by Miracle, 2320, g d Princess, by St Albans, 1412, g g d Blossom, by Cupid, 177, g g g d Simon, 590, g g g g d by Punch, 531, g g g g g d by Bolingbroke, 86, the Earl, by Gainford, 2044, dam by Eclipse, 1949, g d Countess, by Sir Charles, 593.

Mr Ramsay's *Jessamine*, got by St Helena, 5055, dam by Newton, 2367, g d by Albert, 727, g g d by Young Albion, 15, g g g d by Pilot, 496, g g g g d by Agamemnon, 9, g g g g g d by Marshal Beresford, 415, g g g g g g d by the Lathe Bull, 359, g g g g g g g g by Suwarrow.

Mr Ramsay's *Harriet*, by St Helena, 5055, dam Newton's dam, by young Magog, 2247, g d Violet, by Cupid, 1895, g g d by St Albans, 1412, g g g d by Layton, 366, g g g g d by son of Cripple, 171, g g g g g d by Styford.

Mr Stirling's *Dairymaid*, got by Casham, (who was purchased from Mr Smith, Shidlaw,) dam Mary, got by Carlos, g d old Dairymaid. Casham, got by Pawston, dam young Mistress, by Borderer, g d Mistress, by Richmond, g g d Bell, by Shidlaw, g g g d Nell, by Duke.

Mr Stirling's *Strawberry*, got by Casham, (who was bred by Mr Smith, Shidlaw,) dam by Carlos, out of Dairymaid; Casham, &c. as above.

Mr Stirling's *Duchess*, got by Casham, dam by Carlos, out of Cornelius; Casham as above.

Of Heifers—One-year-old.

Mr Forrest's *Vestris*, got by Prince Albert, 4791, dam Vesta, by Plato, 2433, g d Venus, by Bedford, junior, 1701, g g d Vesta, by Isaac, 1129, g g g d by Northern Light, 1281, g g g g d by White Comet, 1582, g g g g g d by Mr Charge's grey Bull, 872.

Mr Milne's *Jessamine*, got by Guy Faux, dam Duchess of St Albans, by St Albans the Second, d by St Albans, 1412, g d by Lawnsleeves, g g d bred by Henderson of Newton, from the stock of Mr James of Stamford.

Mr Simpson's *The Queen*, got by Sportsman, dam by young Hector, 2104, by Hector, 1104, g d by Sir Charles, 1440, g g d by Sir Rowland, 1455, g g g d by a son of Phenomenon, 491, g g g g d by Irishman, 329. Sportsman by Bloomsbury, dam by Mr Wood's Reformer, 2502, g d by Snadon, 1462, g g d by Northern Light, 1280, g g g d by Mr Hunt's Countess, by Yorkshireman, 2862, g g g g d by Mr Wetherell's Wellington, 678, g g g g g d by Mr Maynard's Eryholme of Eryholme, g g g g g g d Mr James Brown's old red Bull, 97.

Mr Simpson's *Charlotte*, got by Sportsman, dam by young Sirius, g d by young Hector, 2104, by Hector, 1104, g g d by Sir Charles, 1440, g g g d by Sir Rowland, 1455, g g g g d by a son of Phenomenon, 491, g g g g g d by Irishman, 329.

Mr Stirling's Heifer, got by Casham, dam Mary. See under Heifers Two-years-old.

On Friday all the stock that had obtained prizes, with all the implements, were exhibited in the show-yard after eleven o'clock, and a sale took place of such of the stock as their owners were disposed to part with, under the deciding hammer of Mr James Chrisp of Newcastle-on-Tyne.

The number of persons who visited the show-yard during the three days must have been very considerable, as above £1800 were collected in that time at one shilling a-head, except in the *forenoon* of the Show day, when half-a-crown was exacted; but had

the weather proved fine, or even kept fair, we have no doubt that many more persons would have visited the exhibition, from the very densely-populous state of the districts which surround the largest city in this part of the kingdom.

The usual business and convivial meetings were held on this occasion. The General Committee met on Wednesday forenoon in the Black Bull Hotel, the Earl of Eglinton in the chair, to appoint the various and numerous sub-committees required to conduct the business of the show-yard on the day of the General Show. The committee dinner, open only to members of the Society, took place in the Trades' Hall, Glassford Street, under the presidency of the Earl of Eglinton, his Lordship having been chairman of the local committee, who arrange on the spot the preparatory business of the Show, prior to the arrival of the deputation of Directors of the Society. The evening was wound up by a ball in the Assembly Rooms. A breakfast ordinary was held on Thursday morning in the Black Bull Inn, and the great dinner took place in the evening, after the business of the Show was finished, in the new Merchants' Hall, Hutcheson Street, presided over by the Duke of Richmond, President of the Society, and where a very large party, not less than 1200 persons, were collected.

What imparted a peculiarity to this meeting in Glasgow was the number of public meetings and breakfasts convened for the express purpose of hearing lectures or conversing on topics of science having an immediate bearing on agriculture. The first of these meetings was held on Wednesday, in the Merchants' Hall, Hutcheson Street, when Professor Johnston delivered a lecture on the "Adaptation of chemical science to the improvement of the soil." On Thursday morning a public breakfast took place in the Black Bull Hotel, under the auspices of the Agricultural Chemistry Association of Scotland, when the topic of conversation was "The best means of making the farmer acquainted with recent discoveries in science, and enabling him to apply these to the cultivation of his own farm;" and which meeting was presided over by Archibald Alison, Esq., Sheriff of Lanarkshire. Another public breakfast was convened on Friday morning in the Trades' Hall, Glassford Street, the Duke of Montrose in the chair, for the purpose of affording to Mr Smith, late of Deanston, an opportunity to give demonstrations in favour of thorough-draining. And a third and concluding public breakfast was held on Saturday, in the Black Bull Hotel, Mr Colquhoun of Killermont in the chair, when the conversation was directed by the chairman to the subject of "The failures in the potato crop." Independently of all these, there was a regular meeting held on Tuesday, at the instance of the members of the Agricultural Chemistry Association, in the Merchants' Hall, Hutcheson Street, over which the Lord Justice-General Boyle presided, to take

consideration the best means of promoting agricultural educa-in schools, and which resulted in the appointment of a com-ee to take measures to promote that species of education in chial Schools of Scotland.

'e think it cannot admit of a doubt that such meetings are ılated to do much good, inasmuch as they afford opportuni-to many people to express their thoughts on agricultural ects, and they give to not a few, unwilling to speak in public, means of hearing the sentiments of others on subjects which ct particular attention at the time ; at all events, they are in-ly more rational and entertaining than mere social meet- at which nothing but complimentary toasts are reciprocated one speaker to another. This is but the second occasion hich such meetings have been attempted, and, considering trouble which they occasion in the getting them up, they ded much gratification to their promoters, and to all who the leisure or the inclination to attend them, and they came ertainly with more success than similar meetings which were npted last year during the Show at Dundee. Conducted, ever, as on the present occasion, they seem to us to possess much of a desultory character, and no one seems aware ıe subjects which are to form the topics of conversation, even of the *exact* hour fixed for each meeting. It would orth while, and the object deserves it, to go about the matter more methodical manner. It would be of advantage, we eive, to select beforehand a few great leading topics, and to ivide them into subsidiary subjects, each to be introduced different person supposed most competent to do justice to Those topics should not be confined to one train of thought, as the cultivation of the *soil* merely, but should also embrace treatment of stock, the peculiarities of cultivated plants, and illustration of particular machines, all which subjects would only impart a varied character to the topic, but the entire s of them might bo made to enforce some undoubted excel-e of practice. A small committee, previously formed for ı subject of conversation, such as crops, soils, manures, hinery, and stock, would be able to get up its own subject manner that would create the greatest interest. A meet-for a conversation on one or other of those subjects might be every morning and evening, with the exception of the day he General Show, when no meeting should be held to inter-with, or to withdraw members from, the onerous duties y member should perform as a constituent of a sub-com-ee, of one of the various business departments of the show-l. The mornings and evenings of Tuesday, Wednesday, lay, and Saturday, could be appropriated to such meetings, allow the Thursday to be entirely devoted to the business

of the Great Show; and were each speaker, or demonstrator, confined to one hour, when a regular lecture is delivered, and were one conversation on a subject confined to the same space of time, different subjects might be illustrated at the same meeting, and several persons find opportunity, in the course of the several days, to express their sentiments on them.

We cannot conclude this account of the Show without adverting to the reprehensible conduct of a part of the populace of Glasgow in attempting to effect a forcible entrance into the show-yard on Wednesday afternoon. We should not have adverted to the subject at all but for the purpose of contrasting this unbecoming behaviour of the Glasgow people with the orderly and admirable conduct of the same class in Dundee, on a similar occasion, last year.

The late period at which this report of the Show is drawn up, enables us to incorporate with it the decision of the judges in the competition of Seed Wheat, which took place at Glasgow on Wednesday, the 2d of October last. The premiums offered by the Society were in these terms:—For the five quarters of the best quality of any named variety of White Wheat, the produce of the counties of Lanark, Renfrew, Bute, Ayr, Dumbarton, or Argyle—Ten Sovereigns. For the five quarters of the best quality of any named variety of Red Wheat, the produce of any of the said counties—Ten Sovereigns.

The judges appointed by the Society were Mr James Tod, Haddington; Mr Charles Lawson, Edinburgh, seedsman to the Society; and Mr John Finnie, Swanston, Mid-Lothian; and their award for the best sample of White Wheat was to Mr Lorne Campbell, Roseneath, Dumbartonshire, and which was ascertained to possess the extraordinary weight of 67½ lbs. per bushel; and the premium for the best sample of Red Wheat was awarded to Mr John Paterson, West Burn, near Cambuslang, weighing 64½ lbs. the bushel. There were 16 samples of white sent in competition by 13 exhibitors, and 5 of red, sent by 4 exhibitors, and they were all of such excellence as to reflect much credit on their respective growers.

THE FARMERS' NOTE-BOOK.—No. VI.

*British Guano.**—We alluded, on a former occasion, (see No. 3 of the New Series of this Journal, page 286.) to the fact that there exist considerable deposits of the excrements of birds on various parts of our coasts, and urged the propriety of collecting

* Edinburgh New Philosophical Journal, vol. xxxvii. p. 313.

these, and trying their efficacy as a manure. It is not likely, it must be at once admitted, that they will be at all equal in fertilizing properties to the same substance from the Peruvian and African coasts, because here they are subjected to the influences of a very different climate; yet when we consider, as remarked by Dr Davy, that a considerable portion of the excrements of birds is very slightly, or not at all, soluble in water; and, further, that it is a question whether the fixed and insoluble phosphates do not perform the most important part in promoting the growth of those plants into the composition of which they enter—there is sufficient reason that the home kind should not only not be neglected, but that attention should be especially directed to it.

Specimens from two accumulations of guano on our own coasts have lately been examined by the chemist just named, and the results are of considerable interest. One of these deposits is on the limestone cliffs of Scarborough Head, Yorkshire, and consists of the excrement of wild pigeons, which frequent that place in large numbers. About forty tons of it, we are informed by Dr Davy, are collected annually by men who follow the difficult and dangerous occupation of gathering eggs, and who, for that purpose, let each other down by means of a "gin," or windlass, from the margin of the cliff, varying there in height from 50 to 200 feet. It is purchased by the farmers in the neighbourhood, at the rate of 1s. per bushel, or about 2s. 6d. per cwt.; and has been used from time immemorial as a manure for grain crops, in the proportion of about 6 cwt. per acre, and with such effect, that it is held in great estimation for its fertilizing power.

The other deposit is on the Little Pentland Skerries, Pentland Firth, and is formed chiefly of the excrements of cormorants, a few gulls, and what Dr Davy calls marrots, which is probably a misprint for garrots, (genus *Clangula*.) It is about 30 yards in length, 20 yards in breadth, and 1 foot in thickness, so that the amount of this manure on that spot alone is probably about 200 yards, or about the same number of tons.

The Yorkshire guano was of a light brown colour—a mixture of fine powder, bits of straw and chaff, and a little sand and gravel. It had a peculiar smell, but not ammoniacal till moistened and mixed with lime, when it emitted that odour distinctly. It was found, from a coarse analysis, to consist of—

10 Saline matter, soluble in water, in which the muriatic, sulphuric, and nitric acids were detected, with lime, potash, ammonia, and magnesia.
24 Organic matter, chiefly vegetable, destructible by fire, not soluble in water.
60 Matter not destructible by fire, of which 21 were soluble in muriatic acid, consisting chiefly of phosphate of lime, with a little carbonate of lime and magnesia; and 39 were insoluble, composed principally of siliceous sand and gravel.
6 Hygrometric or adhering moisture.

100

In another specimen, obtained from a spot protected from the weather, a considerable quantity of lithate of ammonia was detected. Dr Davy is of opinion that the nitric acid present—a substance of which both Peruvian and African guano are destitute—was probably derived, with the soluble salts, from an overhanging surface of limestone rock.

The guano from the second-mentioned deposit was in firm lumps, of a dirty brown colour, occasionally speckled with white. It had a peculiar smell, not unlike that of sea-weed, and unmixed with any ammoniacal odour; but when triturated with lime, it gave off a pretty strong smell of ammonia. When carefully examined with the microscope, it was found chiefly to consist of minute fragments of sea-shells and of sea-weed, with which were intermixed a fine granular matter, and particles of siliceous sand. Dr Davy thence infers that it was derived from birds that feed mostly on sea-weed, and on the smaller mollusca common amongst sea-weed. But there can be no doubt that the birds frequenting the localities in question are chiefly piscivorous; indeed we are not aware that the food of any bird consists of sea-weed properly so called. This excrementitious matter appears to consist of about—

4 Matter soluble in water, chiefly muriate of ammonia, nitrate and sulphate of lime, with a trace of common salt.
28 Matter destructible by fire, a mixture of vegetable and animal matter, nearly insoluble in water.
60 Matter not destructible by fire, consisting of 30.6 carbonate and phosphate of lime, with a trace of magnesia, and a little sulphate of lime, and of 29.4 siliceous sand.
8 Hygrometric water, or adhering moisture.
—
100

From this analysis it is obvious that this substance is calculated to be of great use as a manure, and well worthy of being collected.

Considering (says our author) the insoluble phosphates as not the least important of the ingredients of guano, the excrements of birds, wherever they have been accumulated, whether abounding in nitrogenous compounds, as in dry climates, or in the insoluble phosphates, as in rainy climates, must be valuable to the agriculturist, and are likely to repay the enterprising merchant who may import them. In the arctic and antarctic regions of the ocean, and those bordering on them, as birds feeding on fish there abound, it is probable that great stores of guano of the latter kind are laid up in accessible situations, and which may furnish cargoes to our whalers, and partly remunerate them when unsuccessful in their fishing enterprise. And, nearer home, as in Iceland, the Feroe Islands, and St Kilda, it is likely much useful guano might be collected, were the inhabitants, who depend chiefly for their support on the feathered race, to collect the excrement at the same time that they take the birds or their eggs.

It seems to us extremely probable that, if any of our agriculturists were to offer a reasonable sum per cwt. for the dung of sea-birds, and to take proper means to make this known to the inhabitants of the northern coasts and remote western islands of

, they would ere long obtain a considerable supply. At easons the natives might employ themselves in collecting they can scarcely be engaged in any other profitable on. Along with such an offer, it might be desirable also e general hints should be given as to the places where o is most likely to be found, and the best mode of colnd storing it.—Is not this a subject of sufficient importdeserve the attention of agricultural societies? llowing extract from Dr Davy's paper will be read with —

xcrements of birds, without exception, when first voided, are rich in compounds, and contain more or less of phosphate of lime, birds, genebe admitted to be fertilizers—the effect being in proportion to their n the instance of the solitary bird not perceptible, but in that of gregaespecially in their roosting-places, very manifest. I have examined the ookeries, and have detected in it ammonia and phosphate of lime. And d rookeries, there must be an accumulation of the insoluble salts derived crements of these birds, it hardly allows of question that it will be advanollect the soil so impregnated, from time to time, at proper intervals, oy it as a manure, restoring in this form to the fields a great part of ken from them by these useful birds, in the shape of worms and grubs. ing circumstance in the economy of nature, that the sheltering shrub or e sheltered bird, benefit each other; that the excrementitious matter of ich, to the incurious and uninformed, may appear offensive and a pollu-ectly fitted to contribute to the growth of the plant and its beauty. In ith this is another fact, one which I have lately ascertained, viz., that is no rain, and consequently where there can be no vegetation, there of ammonia, constituting the greater proportion of the urine of birds, is by the action of the sun's rays, into a non-volatile but soluble salt, the oxalate of ammonia—one of the principal ingredients of the great depots n and African guano—instances of the most concentrated manure, absolutely desert wastes, forming a genuine sinking fund for the agriculuntry such as ours, wasteful of its natural manures.

horite Rock as a Manure.—It is well known that certain substances occur in a natural state chiefly composed of e of lime; they differ, therefore, but slightly in their confrom the earth of bones, some of them containing 54½ of lime, while the earth of bones contains only 51½ per ; is obvious that, if these substances could be obtained nt quantity, they might be used as a substitute for bones, ng every reason to believe that their action upon vegetald be equally favourable. This, indeed, has been found case in any experimental observations made on them, these, we believe, have hitherto been on a limited scale. ve phosphate of lime, or apatite, occurs in this country l veins in granite and slate rocks, also in masses both in and and Cornwall, but never in such plenty as to render ch practical value. A variety of this mineral, distiny the name of *phosphorite* is found in some abundance at nwalde in Bohemia, and more especially in Estremadura

in Spain. From the latter locality it is said that a portion imported into Ireland, some time ago, for agricultural purpo and, from the reports circulated regarding the value and a dance of the mineral, considerable expectations were formed the benefits likely to arise from its introduction into this coun In order to examine into the truth of these reports, and to as tain the precise nature and extent of the rock, Prof. Daubeny made a journey into Spain in company with Captain Widdi ton, the latter of whom has written an account of his trave that country. The Professor found that the rock was situated short distance from Lagrosan, a village of Estremadura. lies in an extensive clay-slate formation, and is interstratified the slate, appearing on the surface for about two miles, prese ing a breadth usually of about twenty feet, and a thickness far as could be ascertained, of ten. Its presence does not app to communicate fertility to the soil in its vicinity. It is compo of phosphate of lime, associated with fluoride of calcium, o of iron, and silica. It appears that the extent of the rock been greatly exaggerated by Spanish writers, and, as it was fo that great difficulties would exist with respect to its transpo tion, it is not probable that any further efforts will be made import it in large quantities into this country.

Liebig's Familiar Letters on Chemistry.—Second Series.— noticed the first series of these letters at the time of its app ance, and anticipated for it extensive popularity, both from high reputation of the author, and the spirited and stri manner in which the subject is handled. If a certain tendenc exaggeration be perceptible, and a slight straining to produce most striking effects, these are readily accounted for and exc by the consideration that we have here one of its most enth astic votaries exerting himself to draw the attention of the p lic to his favourite science, which they have hitherto, in opinion, neglected to patronize in a manner at all proportion to its merits. The first series has, in a very short time, pas through two editions in England, has been reprinted in Amer and translated into Italian. Its object was principally to exh some of the most striking results which chemistry has achie The chief aim of the present series is to explain the means methods by which these results have been obtained; in other wo to give some account of the fundamental principles of chemis the mode in which its principal operations are conducted, to p out its philosophical relations, &c. The letters composing second series have been already published in England, in the f of introductory dissertations to a course of lectures in the Lan ‹+ as the circulation of that periodical is almost confined to

al profession, they may be regarded as now, for the first addressed to the general public.

is is not the place to consider these letters, as they relate to eneral subject of chemistry; but they not unfrequently treat tters highly interesting to those concerned in rural affairs, few extracts cannot, therefore, fail to be acceptable to our rs. One of the most instructive of these letters relates to ransformations of organic matters under various circum-es :—

flour of wheat, rye, or any of the cereals, when mixed with twenty times its of water, at 75 C. = 167 F., yields a thick paste, which, after a lapse of a irs, becomes thin and fluid, and assumes a very sweet taste. The starch of r absorbs a certain amount of water, and in consequence of a new manner of ment of its atoms, changes first into a kind of gum, and then into grape-. This transformation is caused by the gluten of the flour passing itself into of decomposition. The liquefaction of the dough in the preparation of bread s upon the same cause.

same formation of sugar takes place in the germination of corn. All the contained in wheat, barley, rye, &c., becomes, during the developement of m, converted into sugar, by the action of the adjacent particles of gluten. The itself assumes quite altered properties; it becomes soluble in water like starch, e aqueous extract of germinated corn (malt) prepared in the brewing of beer, is called sweet-wort, is heated to the boiling point, a quantity of the gluten, had become soluble and dissolved in it, separates in a state in which it cannot inguished from coagulated animal albumen. The remaining portion of the is contained in the wort in the same state as the matter in the juice of the which contains sulphur and nitrogen, and which is, therefore, precisely the n constitution; so that in the fermentation of the beer it separates in the f yeast, which exactly resembles the yeast of wine.

maturation, as it is called, or sweetening of winter fruits, when stored up for reservation in straw, is the result of a true fermentation. Unripe apples and ontain a considerable amount of starch, which becomes converted into sugar nitrogenous constituent of the juice passing into a state of decomposition, ansmitting its own mutations to the particles of starch in contact with it.

skin of animals, the mucous membrane of the stomach and intestines, and inary bladder, have many properties in common with gluten and yeast. In resh state these substances exercise not the slightest influence upon starch or ugar, but when placed in water for a few hours, or even when simply exposed atmosphere, they quickly pass into a state of decomposition, which renders capable of converting, with great rapidity, starch into sugar, and milk-sugar ctic acid.

s property of the mucous membrane of the stomach of the calf has been made from time immemorial, in the preparation of cheese, in order to make milk ate, or, in other words, to effect a separation of the cheese from the other tuents of milk.

solubility of cheese in milk is in consequence of the presence of alkaline hates and of free alkalis. In fresh milk these substances may be easily ed by the property they possess of restoring the blue colour to reddened litmus The addition of any acid, by neutralizing the alkali, causes the cheese to ite in its naturally insoluble state. The acid indispensable for the coagulation k is not added to the milk in the preparation of cheese, but it is formed in the t the expense of the milk-sugar present. A small quantity of water is left in t with a small piece of a calf's stomach for a few hours, or for a night; the absorbs a quantity of the decomposed mucous membrane so minute as to be ly ponderable; this is mixed with milk; its state of transformation is commu- d (and this is a most important circumstance) not to the cheese, but to the ugar, the elements of which transpose themselves into lactic acid, which neutral-

izes the alkali, and thus causes the separation of the cheese. By means (
paper, the process may be followed and observed through all its stages: the
reaction of the milk ceases as soon as the coagulation begins. If the chee
immediately separated from the whey, the formation of lactic acid conti
fluid turns acid, and the cheese itself passes into a state of decomposition.

Fresh cheese-curd, carefully freed from water and milk-sugar, by expre
the addition of salt, is a mixture of caseine and butter; it contains all the p
of lime, and part of the phosphate of soda, of the milk. When kept in a c
a series of transformations takes place, in consequence of which it assume
new properties: it gradually becomes semitransparent, and more or less soft
out the whole mass; it exhibits a feebly acid reaction, and developes the char
caseous odour. Fresh cheese is very sparingly soluble in water, but after hav
left to itself for two or three years, it becomes, especially if all the fat be p
removed, almost completely soluble in cold water, forming with it a solutio
like milk, is coagulated by the addition of acetic acid, or the mineral aci
cheese which, while fresh, is insoluble, returns during the maturation, or r
as it is called, to a state similar to that in which it originally existed in t
In those English, Dutch, and Swiss cheeses, which are nearly inodorous, an
superior kinds of French cheese, the caseine of the milk is present in its u
state. The odour and flavour of cheese is owing to the decomposition of the
the non-volatile acids, margaric acid, and oleic acid, and the volatile buty
capric and caproic acids, are liberated in consequence of the decompo
glycerine, (the sweet principle of oils, or, as it might be termed, the sugar
Butyric acid imparts to cheese its characteristic caseous odour, but the dif
in its pungency or aromatic flavour depend upon the proportion of free l
capric, and caproic acids present.

The transition of caseine from its insoluble into its soluble state depends u
decomposition of the phosphate of lime by the margaric acid of the butter; m
of lime is formed whilst the phosphoric acid combines with the caseine, fo
compound soluble in water.

The bad smell of inferior kinds of cheese, especially those called meagre,
cheeses, is caused by certain fœtid products containing sulphur, and what are
by the decomposition or putrefaction of the caseine. The alteration which th
undergoes, (that is, in becoming rancid,) or what occurs in the milk-sugar
sent, being transmitted to the caseine, changes the composition of the latt
stance and deteriorates its nutritive properties.

The principal conditions for the preparation of the superior kinds of chees
obvious circumstances being, of course, duly regarded) are, a careful remov
whey which holds the milk-sugar in solution, and a low temperature during
turation (or ripening) of the cheese.*

The differences in flavour and odour of various kinds of cheese depend u
methods employed in the manufacture, upon the state of the rennet when
the milk, upon the addition of salt, and upon the state of the atmosphere du
period of making. It must be admitted that the plants, and especially the
plants, upon which the animals feed, exercise some influence upon the quali
cheese; but this influence is very slight and subordinate. The milk of th
spring, summer, and autumn, is very unequal in its composition, but this
occasion any perceptible difference in the cheese prepared in one and t

* The quality of Roquefort cheese, which is prepared from sheep's mi
very excellent, depends exclusively upon the places where the cheeses are l
pressing, and during maturation. These are cellars, communicating with
grottoes and caverns, which are kept constantly cool, at about 41° to 4
by currents of air from the clefts in the mountains. The value of these
storehouses, varies with their property of maintaining an equable and low
ture. Gvion (Ann. de Chimie et de Physique, xlv., 371) mentions that
cellar, the construction of which had cost L.480, (12,000 francs,) wa
L.8,600, (215,000 francs,) being found to maintain a suitable temperatur
vincing proof of the importance attached to temperature in the preparati
superior cheeses.

y. If the plants upon which the cows feed exercised any considerable influ- upon the quality of cheese, the same pastures could not, at different seasons, h cheese of similar quality, inasmuch as the developement and flowering of nt species of plants belong to various seasons.

have, by personal inspection, satisfied myself that the method of preparing the se is quite different at Chedder from that practised in Gloucestershire, and this differs from the plan pursued in the manufacture of Stilton cheese.—Pp. 163 3.

We should willingly continue our extracts from this instructive ume, but we have already occupied all the space we can ord for that purpose. The observations on the influence of ay, the manufacture of wine, and preservation of food, will be und particularly interesting.

*Petzholdt's Lectures to Farmers on Agricultural Chemistry.**— the practical husbandmen of this country find it somewhat dif- ult to acquire a competent knowledge of a science which they n no longer doubt to be essential to their interests—if they find no easy task to master its somewhat peculiar nomenclature and raseology, and to get the current of their thoughts to flow in annels in a great measure new to them, it can scarcely, we ink, be ascribed to any want of endeavour, on the part of emists, to afford them all the requisite facilities. So many tempts have been made to explain, illustrate, and simplify the bject, that books on chemistry have lately assumed almost n entirely new aspect. They have become popular, diffuse, in a eat measure divested of technicalities, and, rather than en- ging in the discussion of principles, they aim at eliciting prac- cal results. It is to be hoped that these ends may be and have en attained without any sacrifice of scientific precision and curacy; that the spirit of sound science remains, and that the ly change it has undergone is in the mode of its external mani- station. Among those writers who have endeavoured to pre- ent the subject in a plain and easy form is the author of these Lectures to Farmers." He goes over the usual series of sub- ects, and treats of them in a clear intelligible manner, occa- ionally describing experiments by which the phenomena of che- istry may be exemplified. Any one, by a careful perusal of this ork, will be in a condition to enter with profit on the study of hose of a more profound and elaborate character. It may, there- re, be recommended as a safe guide to the more elementary arts of the subject. The author seems to have formed a just onception of the benefits that may be expected to be conferred by hemistry on practical agriculture, although he has probably but ttle personal experience in the latter, a qualification, however,

* London: Taylor & Walton, 28, Upper Gower Street. 1844. Small 8vo.

greatly to be desiderated in all who attempt its improve[illegible] this means :—

For the purposes of cultivation, then, a knowledge of the constituents [illegible] generally, on the one hand, and of the special constituents indispensable to [illegible] ous kinds of cultivated plants on the other hand, are the necessary prelimin[illegible] sitions to enable us to lay a rational foundation for agriculture as a scien[illegible] therefore, very easy to explain why it is only of late years that agricultur[illegible] raised to the rank of a science, since chemistry itself, which must neces[illegible] cede it, has but very recently become a science. It was only after the va[illegible] stances surrounding plants—atmospheric air, water, and soil—had been [illegible] investigated, and after the material wants of vegetables had been ascertain[illegible] ful and minute examinations, that the construction of an agricultural s[illegible] be reasonably thought of; all attempts at such an attainment, previous to [illegible] true chemistry, necessarily miscarried, &c.—P. 196.

*Nicol's Geology of Scotland.**—It is known to every [illegible] high degree of interest has been attached to the geology of S[illegible] ever since that science began to be cultivated in this countr[illegible] remarkably prominent and diversified surface of the north[illegible] sion of the island, contrasting so strongly with that of the s[illegible] portion, and by which its scenery is rendered so striking [illegible] turesque, is connected with geological phenomena of e[illegible] ing variety and of high importance. The southern [illegible] presents us with many interesting displays of the transiti[illegible] of rocks, and also of those igneous species which seem [illegible] be connected with certain stratified formations; in the [illegible] district, the secondary rocks predominate, the surface is[illegible] fore, a level or slightly undulating plain, with numerous [illegible] coal and limestone, and the interesting appearances a[illegible] with these; the great northern or primary district is s[illegible] contrasted with the two others, and affords a field in [illegible] older stratified and igneous rocks may perhaps be stu[illegible] greater advantage than in any other locality. Many [illegible] tions, as might be expected, have been devoted to a su[illegible] once so extensive, so varied, and so rich. A considerab[illegible] ber of years have now elapsed since Professor Jameson [illegible] Boué described many of the most interesting geological [illegible] mena of Scotland, the former in his "Geological Trav[illegible] latter in his "Essai Geologique." Dr Macculloch's [illegible] reference to Scotland are well known; and many valuable [illegible] have appeared in the transactions of the principal scientif[illegible] ties. Of late years, since geology became such a popular [illegible] there has been a great accumulation of information on [illegible] ject. Many extensive districts have been carefully a[illegible] minutely surveyed; every geological appearance of any [illegible]

* Guide to the Geology of Scotland, containing an Account of the Chara[illegible] tribution, and more interesting Appearances of its Rocks and Minerals[illegible] Geological Map and Plates. By James Nicol. Edinburgh: Oliver & Bo[illegible]

urately noted; and numerous geological maps of differ-
s of the country have been constructed. The essays
ten at the suggestion of the Highland and Agricultural
of Scotland in particular are deserving of honourable
, as having supplied an immense mass of valuable mate-
istrative of Scottish geology. Most of these publica-
owever, have reference to some particular locality only,
y are, besides, widely scattered throughout numerous
als and transactions. A work which should embody the
results of all the investigations that have been under-
nd give a uniform and consistent view of Scottish geology
on the present state of our knowledge regarding it, was
ch required. This want Mr Nicol, in the above publication,
tually supplied. The nature and limits of his work do
ed, allow him to give a complete account of the geology
nd—that is to say, they do not permit him to enter into
letails and descriptions which might have been lavished
ubject—but we have a satisfactory view of all the more
ble facts to be observed, and the more important results
l. Indeed it is surprising how much has been compre-
by a judicious management and condensation of
s, in this moderately-sized volume. Not only will the
and general observer find enough to gratify their curi-
he agriculturist, those interested in the occurrence and
cal management of minerals, and others who require
inute information, will, to a considerable extent, find
spective objects facilitated; and even the professed stu-
the science will obtain much useful information. The
it will at once be seen, is anything but a mere compiler:
indeed, as it was his duty to do, availed himself of all
lished information on the subject, but he has also drawn
from his own resources; he has traversed most parts of
itry, hammer in hand; he has enjoyed the advantage of
g geology on the Continent, and is, therefore, enabled to
e useful comparisons; and he is evidently an attached fol-
the science. The work is illustrated with numerous col-
lates of geological sections, and also a geological map of
l, which we are glad to see is coloured with tolerable
y and distinctness.
ollowing Table is an attempt to shew, in square miles,
tive extent of the different rock formations in Scotland,
robably not far from the truth.

Formations.	South.	Centre.	North.	Whole Scotland
Gneiss,	...	...	9,600	[illegible]
Quartz rock,	...	...	800	[illegible]
Mica-slate, &c.,	...	...	3,250	[illegible]
Clay-slate,	4,100	...	650	4,7[illegible]
Old red sandstone,	450	2,050	2,400	4,9[illegible]
Coal formation,	250	1,500	...	1,7[illegible]
Oolite,	...	...	60	[illegible]
Total strata,	4,800	3,550	16,760	25,11[illegible]
Granite,	160	...	1,600	1,7[illegible]
Trap,	200	1,350	1,200	[illegible]
Total igneous rocks,	360	1,350	2,800	4,5[illegible]

From this Table the distinctive geological character of the different parts of country is very apparent. The central valley is the most simple in structure, sisting only of three great formations—two of stratified and one of igneous The south is more complicated, two other formations being added, one of covering four-fifths of the district. In the north, four other stratified form appear, whilst one—the coal formation—is wanting. The most persistent of deposits is the old red sandstone, forming a considerable portion of each three regions, and found from the extreme south to the remotest north of the try. The trap rocks also occur in each of these great divisions, whilst gra mostly limited to the northern. . . . In contrasting Scotland with En two points of difference immediately appear. These are, the great prevale the igneous and crystalline rocks, and the almost total want of the more secondary and tertiary formations.—Pp. 247—248.

*Low on Landed Property.**—The general title of this work not seem to be very happily chosen, as it does not convey a very rate idea of the precise kind of information the volume is inte to furnish. The greater, and by far the most useful, portion relates to farming, in some one or other of its branches; the other subjects it treats of, relating to rural economy in gen are embankments, roads, minerals, and woods, thus leavin a few matters of interest connected with landed property gether untouched. The opinions of a writer who has so devoted his attention to these topics are well worthy of deration. We do not think that, in general, they possess novelty, when we consider what has recently appeared in v quarters on similar subjects; but they are clearly and ofte cibly stated, and will co-operate with other efforts to the purpose, in bringing about useful results. We have se

* On Landed Property, and the Economy of Estates; comprehending t tion of Landlord and Tenant, and the principles and forms of Leases—Farm-B Enclosures, Drains, Embankments, Roads, and other Rural Works, Mine Woods. By David Low, Esq., F.R.S.E., Professor of Agriculture in the sity of Edinburgh. London: Longman, Brown, Green, and Longmans. 1

ɛ in which the duties and responsibilities of landlords, in ;ion to their tenants, have been so distinctly and impressively ted out; and it is to be hoped that what has been said will be without its effect in a quarter where some reformation is ıuch needed.

ı the relation subsisting between landlord and tenant, in the of farming, the author contends strongly for the necessity of finite lease, and his arguments, we think, must carry convic- to the mind of every one. The want of such a security is a ce of injury at once to the tenant himself, to the landlord, to the country at large. It is the principal cause of the culture of a large portion of England having continued com- ,tively fixed, while every other branch of industry has been ıncing.

er the finest parts of England we find a tenantry nearly stationary in their ; and condition, opposed to innovation on established practices, and educating families as they themselves have been educated. Everywhere they will be to prefer their tenancy at will, to all the advantages which a permanent tenure fford, because they know that they pay a lower rent, and can make it good by er exertions. The argument has again and again been used against the exten- of leases, that the tenants themselves set no value on them; but to how dif- t a conclusion ought the existence of such a feeling amongst the tenantry of a ,ry to conduct us! The fact itself shews that the absence of leases may render antry ignorant of the means of employing their own capital with advantage, ›osed to the exertions which improvement demand, and better contented with sy rent and dependent condition, than with the prospect of an independence to rned by increased exertion. And not only does the system of tenancy at will, so y extended over England, and become, as it were, the habit of the country, upon the condition of the occupiers of farms, and the means of perfecting their art, but it affects, essentially and directly, the interests of the landowner and ountry.—P. 10.

[ow full of truth are the following observations, and to how ıy instances could we turn in which the evils pointed out ɜ been lamentably exemplified!

may be laid down as a rule of good practice, that a fair and lenient exaction be made on the industry of the farmer. This is not merely matter of fair ng, but of good policy. . . . It is rarely that a landlord profits by a system ,ck-rents rigidly enforced. For a few years he may gain by exhausting the al stock of his tenants, but almost always, sooner or later, the injurious effects ne apparent, in the ceasing of improvements, the failure of tenants to fulfil obligations, and the general deterioration of the property in condition and ıcter.

is common to hear of reductions of rent, as ten, fifteen, or twenty per cent., › by proprietors at their audit-days, and announced in newspapers and other- as acts of great liberality. But bounties in this form are nearly useless to the ıt. The necessity, where it exists, of making little abatements of this kind, ld lead us to the conclusion that an estate is under bad management. The rent ıich land is let should be such that no temporary bounties of this kind can be ed. The tenant who takes land, and the landlord who lets it, should so adjust ent that the tenant shall be able to bear the pressure of deficient crops, or of ›rices arising from favourable ones; and no prudent man ought to contract for ıt which will not allow him to meet that contingency of his trade which arises a fluctuation in the amount and price of his commodities. Whenever land is to have been overlet from any cause, the rent should be at once reduced, and

the tenant put into a condition to meet his future engagements. To exact from him a rack-rent, and leave him the chance of a miserable relief as occasion requires, at an audit-day, is not truly to relieve the tenant, but to place him in a condition of dependence, from which he ought to be freed.—P. 16.

The author bestows a considerable degree of attention on the important subject of the buildings of the farm, and cottages for the occupation of the labourers; and on these points many useful suggestions are given. Numerous designs are furnished, from plans and models prepared by Mr Newlands for the Agricultural Museum of the University of Edinburgh, of onsteads adapted to farms of different sizes and character. In speaking of the position of the farm-house, we are surprised to perceive that the author is rather in favour of it being placed in immediate contact with the farm-buildings, a situation where it is necessarily exposed to a multitude of disagreeable influences, and where it is disliked exceedingly, at least in Scotland, even by the occupiers of the smallest farms. Professor Low, like many other writers on the same subject, is a zealous advocate for the introduction of the German stove into the cottages of the peasantry as the most effectual means of heating them. He says—

A better medium of heating (than by an open grate) is the stove placed apart from the wall, in the manner practised in all the colder parts of Europe. By means of their simple stoves, the inhabitants of Germany, Sweden, Russia, and other countries, are enabled to give a far greater degree of warmth to their apartments than is known in this country, and to perform all their culinary operations with greater ease. It is remarkable that England should fall short of countries much behind her in the arts, in a simple matter of domestic economy. It is [illegible] that Englishmen wish to see the fire; it were better that Englishmen should [illegible] to feel the heat. The stove, indeed, does not answer the purpose of ventilation so well as the grate; but, unfortunately, the cottage is, from its nature, too [illegible] ventilated, and the inmates suffer far more from the want of heat than of air. [illegible] stoves, the best, perhaps, is the common German stove, which consists entire[ly of] brick, combining in its use economy of fuel with the facility of performing the n[ecessar]y operations of the household. On the shelves of the stove pans may be pl[aced] for boiling water, which is done with much less waste of fuel than by means of [pots] suspended over the fire. It is by means of little pots kept simmering for a [long] time that bones, and a very small quantity of food, are made to yield those n[utri]tious soups so grateful and wholesome to the labouring man, but which are sca[rcely] at all obtained by the English peasant. Baking, too, can at all times be perfo[rmed] by the stove. It is immeasurably superior to the best constructed grate for a[fford]ing warmth to the room, not a fourth part of the fuel being required. By mea[ns of] a damper the combustion can be regulated to the degree required, and whe[n the] stove is once heated, it retains its temperature for a long time after the f[ire is] extinguished. The desire of persons in this country to see the light of a fire [is a] mere prejudice of habit. In countries where the stove is introduced, persons [have] just as great a dislike to see the open fire, which neither conveys the ide[a nor] affords the reality of an agreeable and equable temperature.—P. 184.

To us it appears quite obvious why an open fire is prefe[rred] by the peasantry of this country, and the reasons appear [to us] so strong as to render it very unlikely that it will ever be o[ther]wise. It seems to be completely overlooked, in the above o[bserv]ations and others which we have seen to the same purport,

pen fire gives out *light* as well as heat, and that it is nearly seful for the one purpose as the other. By the light of a ıge fire nearly all the humble domestic operations can be .ed on of a winter 'fore-supper-time. By such a light we often seen the female engaged at her spinning-wheel—before occupation became obsolete—in knitting stockings, or in) other similar employment; the husband mending his own .is children's shoes, or reading; and the children following : sports on the floor. By such a light the whole apartment, ›ver humble, assumes an air of comfort which nothing else give it; even the stained walls and smoked rafters cease to nsightly under the rich and ruddy glow. Most of the social 'course that takes place among the peasantry in the winter ›n is around their hearths in the evenings; it is there that ency has been given to those tales and legends which have ›een without influence in forming their character. Cottages ighted by a lamp in those countries where stoves are used; how trifling is the light of a lamp or a candle when un- l by that from an uncovered fire! It scarcely does more make the darkness visible, leaving most of the apartment in est gloom. By the light and cheerfulness which it diffuses,) does far more than compensate for its inferiority to a stove nitting heat. Well, therefore, may an Englishman wish to he fire. It is often one of the most pleasing spectacles he contemplate; and, so far is the wish from being a mere pre- :e of habit, that it is founded on obvious principles of our re. There, assuredly, must the prejudice exist where a ng fire is looked on with dislike, and conveys no idea of an eable temperature. In many parts of the country, where is scarce, the chief fuel of the peasantry consists of the ıings of plantations, thorns, underwood, occasionally whins, what generally is called in the south of Scotland "lighting- lin." These could not be used in a stove, neither could 'al kinds of the cottagers' cooking operations be managed by ıeans. For these and other reasons, which might be easily nced, if there was any occasion seriously to contend *pro* , we cannot consent to the proposal for extinguishing the ıgers' domestic sun; nor can we admit, as here asserted, ıt it is beyond a question that the use of the homely stoves ıe German peasant would add, in an incredible degree, to means of comfortable and economical subsistence of the ıring classes of the British islands."

treating of coal-mines, which he does at some length, the or gives the following graphic sketch of that functionary ›d the Trapper, who attends to the trap-doors, or valves of nine:—

The trapper is the humblest and youngest member of the community. He b his duties when a mere child. He is first placed by the smaller trap passed b putters; and then, when he is grown a little in strength and years, he is t ferred to the larger trap of the rolley-way; the chief difference to him being, should he have slumbered at the former post, he was awakened by the fist o putter, whereas, in the second, he is roused by the not more merciful lash o rolley-boy. At half-past two in the morning he is awakened from his tranquil buckles on his sooty clothes, and filling his tin bottle with coffee, and furnished his lump of bread, is lowered down the shaft, and hurries to his nook, a m more, it may be, away, and takes his place by the trap-door. He is, for a w two, allowed a candle to keep him from being frightened or falling asleep three-halfpence out of tenpence, his usual wages, are too much for such a lux light. He sits, then, in darkness—such darkness as one above ground can sc fancy—for twelve hours out of the twenty-four, without a soul to commune without daring to move from the spot or close his eyes. Should he slumber space ever so brief, the hard fist of the putter, or the yet harder yard-wand deputy-overseman, may awake him to the consciousness that he has done som wrong. The poor child cannot know how upon the valves he is set to wat pend the breathing of so many tall men around him, and the safety of the world in which he is entombed; but he is soon mechanically inured to his s charge. Cuffs and blows he may meet with and deserve; but more th thorough "hammering," as he calls it, is rarely necessary to banish the de sleep. Nor is his watch altogether so solitary as it might seem. It is ev anon relieved by the passing lamp and the endless clink of hammers aroun telling him that he is not alone. At four o'clock, the well-known cry of " loose," shouted down the shaft, and responded to by a hundred voices, is car miles and miles along the rooms and air passages to the furthest recesses mine. It is the signal to cease work for the day, when all yet in the mine to the outlet. The trapper follows as soon as the last putter has passed, en basket in his turn, and, in a few minutes, is seated at the blazing fire, let r of a father's cottage, where a smoking dinner of potatoes and bacon awaits hi is then washed with hot water and put to bed, to sleep a sleep that kings migl The training of the youthful trapper, then, is not necessarily so harsh and as we regard it. It is painful, indeed, to think that a child should be reduc mere machine for so many years, yet, otherwise, the discipline is not more than for many other mechanical employments. The little trapper feels that h time be raised to the dignity of a rolley-boy; that he will have a horse and ready caparisoned for him when he descends the pit, and, better still, a lam he will have the privilege of lashing the sleeping trapper, as he himself m been lashed; and, when he becomes a rolley-boy, he knows that he will sc putter, which is a wonderful accession of dignity; and then, last of all, the c of his hopes and the top of his ambition, he will be a hewer!—P. 462.

The subjects which Professor Low takes up in this volu is scarcely necessary to say, are well and ably discussed. A space is occupied with an account of forest trees, a descrip their appearance, and modes of culture—a subject on whicl one, into whose hands this volume is likely to come, pr possesses ample sources of information already; and the a in this department, can scarcely be said to have given a thing new. As a work on farming, it is very incomplet the range of subjects, and the same thing may be said c a work on landed property. But as a series of treatises or ent subjects, belonging to both these departments, it can to be perused both with interest and profit.

-*Transactions of the Royal Agricultural Improvement Society of* *'land*, *for the Year* 1843.—It is interesting to observe how adily this society, only of a few years' standing, is continuing advance, and what important consequences have already re- lted from its operations and influence. Last year the number annual subscribers amounted to 581, from whom the sum of 997 : 6s. was received. The donations amounted to £4,859 ; ese have been funded, and will continue to be so, the interest one, and the annual subscriptions, being applied to the general jects of the society. The funds at the disposal of the society r 1843 amounted to £1838 : 1 : 8, of this no less than 1246 : 13 : 10 were expended on premiums alone. An equally ratifying feature in the history of this society is the great num- er of local farming societies it has been the means of calling into istence in various parts of the country. These are no fewer ıan 100 in number, and they are of the greatest importance in rrying out the objects of the central body, and enlisting the -operation and support of the farming classes. Two of the jects which the society have exerted themselves particularly to omote are thorough draining and the reclaiming of waste nd, for both of which Ireland presents such wide scope. A con- derable extent of the former has been executed, and was pro- unced by Mr Smith of Deanston, whom the society procured inspect the work, to be well and efficiently performed accord- g to the Deanston principle. The excellence of the annual ttle show, under the superintendence of this society, is well ıown. We notice that, among the premiums awarded on that casion, there is one class to which the English and Scottish ricultural societies do not extend their patronage, viz., pre- iums for needle-work and embroidery; so that, among Ayr- ires, short-horns, and Southdowns, are to be seen figuring away ch items as, *Open and Oblique work*, and *Sewed babies' caps!* he present fasciculus of transactions contains several lengthened ports on reclaiming waste land and draining, which are not only teresting as examples of these important operations being exten- vely carried on in a country where they are so much needed, ıt deserve perusal in the possibility of supplying hints which may useful in similar undertakings elsewhere.

Supplementary Note on the Tussac Grass. By the Rev. JAMES UNCAN.—In the notice of this grass given in a previous part of is number, it is stated that a report appeared in the news- ipers to the effect that plants had been reared in this country Dr Murray of Hull, he having succeeded in making the seeds erminate by steeping them in a chemical solution. Since the count on a former page was printed, I have been favoured with

a communication from Dr Murray, by which it appears that th statement is correct. He has succeeded, by the means alluded to, in rearing a few plants, and has transmitted to me a small packet of seed from the only portion that has germinated in this country, all other attempts, although these have been numerous having entirely failed.

During last summer Dr Murray has made numerous experi ments, with a view of ascertaining the effect of different chemi solutions on the germination and growth of grains and seeds, an many of the results have proved highly curious and interestin The solutions which he has found to produce the most remark able luxuriance in the plants, are silicate of potassa, oxalate ammonia, nitrate of ammonia, super-phosphate of lime, sulpha of ammonia, muriate of ammonia, and phosphate of ammon The solutions were used in a diluted state, and the average peri of steeping the seeds was about thirty hours. The three fir mentioned substances seem most efficacious in stimulating ger nation. Those which operate most powerfully in inducing a str and luxuriant growth are silicate of potassa, which is the m remarkable, sulphate of ammonia, and phosphate of ammo It ought to be observed, however, in reference to the last, t it was found, at least in one remarkable instance, fatal to germination of mummy wheat; with barley (the blue Mo barley) it was successful. In one instance, Dr Murray cou 101 stems from one grain of Moscow blue barley, an increas much short of five thousand fold. All the chemical solu tried, save that of silicate of potassa, proved fatal to the gern tion of turnip seed; and this was likewise the case with the of leguminous plants, such as vetches, kidney-beans, &c.

Liquid Manure Composts. By Mr JOHN LAWSON, Elg The attention of the agriculturist has of late years been particularly directed to *liquid manure*, and to the mode in it may be most beneficially applied to the soil. The advan derived from it have been more or less insisted on by va farmers, according as its effects have been more or less exhi by success in application, arising sometimes, perhaps, from manner in which it has been applied to the soil, some from the nature of the soil itself, and sometimes from the of crop it was intended to benefit. The writer has for time past been in the practice of applying it to the soil manner somewhat different from what has been usually tised, and as the benefit he has derived from it is very con able, while, at same time, the mode of preparing it, an expense of doing so, (a matter always of great importa the farmer,) is cheap, and of easy application, he will tak

to communicate the process, through the medium of this

e first place, it may be premised that, for the purpose of ng a *portion* of the liquid manure, a quantity of earth is in the bottom of the cattle folds, into which also the urine e cow byres is conveyed by a drain, so that it is only the urine which the earth and manure in the cattle folds absorb and retain which is allowed to run into a tank or in the corner of one of the cattle sheds. A common s placed in the corner of the tank, and by it the urine is . out, in order to be mixed with the materials after men- and the mode of forming those materials it is now d to describe. A wooden shed is erected beside the it on the *outside* of the wall of the cattle shed, and a pipe v feet in length conveys the urine from the spout of the ɔ the materials to be deposited in the wooden shed. This 'eserves the materials from rain; and feal or strong clay :ound its bottom, to the height of about 18 inches, to any urine running out.

naterials with which the urine is mixed are formed in the g manner, viz.:—1 bushel of lime shells, of the common the district, is reduced to powder, by being *half*-slaked ιter, and, when in a powdery state, is mixed with sulphuric uted with eight times its weight of water. This process :onverts the lime into gypsum, or sulphate of lime, and n a state of fine powder is the best state for absorbing ne: 10 lbs. of sulphuric acid were applied to 1 bushel of ιt the exact quantity will, of course, depend on the purity ime. The lime thus converted into gypsum is mixed with ;htly burnt, at the rate of 5 bushels of the gypsum thus to 1 cart-load, or about 30 bushels of earth.

materials (or gypsum and earth thus prepared) are then ɔ the wooden shed, and as the tank fills with urine, it is ow and then pumped over the materials thus formed. ocess is continued during the autumn, winter, and spring , an additional quantity of earth and gypsum being added to the heap, as the former quantity becomes satu- vith the urine. In this manner a large quantity of ə manure may be obtained.

ιs applied to the land in the following manner, viz.:—The lrills were first formed in the common way, and *partly* down by a *single* strike of the harrows. The manure or t was then sown by hand in the bottom of the drills, and up by the plough, which again formed the drills over it. :nip seed was then sown on the top of the drill in the ιanner. Should the manure be too moist to be sown by

the hand, the addition of a little more dry earth will make it quite dry and manageable.

The compost was applied this year to turnips and rape, (the former growing on a light loam, and the latter on thin sandy clay.) at the rate of from 24 to 30 bushels to the imperial acre, and the crop is as good as any in the district.

The time occupied in preparing the materials for this compost is very short, and may easily be performed by the servants on the farm. The earth was burned on the top of the limestone in a lime kiln, but where a farmer has not one in which to perform the operation, it may be burned in a small temporary kiln made on purpose.

About 10 or 15 loads of the mixture may be put at first into the wooden shed, and may be turned over, together with what more may be added to it, once or twice, or oftener, in the course of the season, so as to allow the urine to incorporate with it. On a farm of 200 acres, as much manure may thus be obtained in a season as will be sufficient for 10 or 12 acres of turnips, from the *surplus* urine of the byres and cattle folds.*

By the process now described, the liquid manure becomes extremely manageable, and may be conveyed to the most distant parts of a farm, with almost as much ease as bones or guano. By this method also, of forming artificial gypsum, we obtain it in a state of very fine powder, and the earth with which it is mixed tends still farther to keep its particles separate from each other, a matter which will at once appear to be of very considerable importance.

To every cart-load of the mixture I have been in the practice of adding about 1 bushel of bones, previously dissolved in dilute sulphuric acid, and from 2 to 3 bushels of coal-ashes, in order to improve its quality.† The bones and ashes are added to the mixture a few days before it is applied to the land. They are spread on the top of the mixture in the wooden shed, and turned over by the spade, and any lumps or knots in it broken small.

The cost of preparing this mixture, exclusive of the labour which may be performed by the servants on the farm, may be stated, for one acre of land, as follows, viz. :—

5 Bushels of Lime Shells, ...	L.0	2	4
50 lbs. of Sulphuric Acid applied to the Lime Shells, at 1¼d. per lb.	0	5	2
1 Bushel of Bones, ...	0	2	9
22 lbs. of Sulphuric Acid for do. at 1¼d. per lb.	0	2	3
	L.0	12	7

* Are the courts freed of rain-water by spouts placed around the easings of buildings that surround them ?—EDITOR.

† The bones are dissolved thus :—To each bushel of bones add 22 lbs. of sulphuric acid diluted with 44 lbs. of water. Put the diluted acid into a *wooden* cask, and add the bones. Let the whole remain in the cask for twenty-four hours, stirring frequently as can be done conveniently.

he price of the coal-ashes is not added, as they may generally ;ot in sufficient quantity on the farm, from coals consumed in dwelling-house.

.s in part connected with this subject, it may be mentioned , when bones, dissolved in diluted sulphuric acid, are applied and, they become more manageable, and of more easy appli- on, by being mixed with burnt earth, in the proportion of 4 els of burnt earth to 1 bushel of bones. They may then be n in a *dry* state, instead of being applied in a liquid state by ns of a water-cart.

When Turnips are best removed from the Soil. By Mr JOHN ARTH, Akeld, by Wooler.—Having for many years felt bts that land, when bearing a crop of turnips, received as h benefit as is generally alleged by allowing a part of the p to be eaten off by sheep, and conceiving it highly probable t turnips were much deteriorated in quality by remaining the ground till spring, I determined, in 1843, to make some nparative trials on the subject on two adjacent ridges of deep ivial soil, incumbent on clay mixed with sand, bearing each 13 square yards of a crop of Swedish turnips.

From ridge No. 1, in November 1843, the turnips were re- ved, and stored in a manner afterwards to be described, leav- the tops to be ploughed in as soon as they could conveniently done. From ridge No. 2, at the end of March 1844, two-thirds he turnips were removed, leaving the remainder to be eaten by sheep. Being desirous to have a turnip from each ridge ted, I sent them to Dr Murray, on the 20th of April, when he s lecturing on agricultural chemistry at Kelso, and he under- k their analysis, and transmitted to me the following results :

	Turnip from Ridge No. 1.	Turnip from Ridge No. 2.
	per cent.	per cent.
Water,	90.	88.
Ligneous Fibre,	2.9	5.7
Gluten and Albumen,	2.1	2.0
Gum and Sugar,	5.0	4.3
	With a trace of Starch.	No trace of Starch whatever.
	100.0	100.0

ing about 15 per cent. in favour of No. 1.

Barley was sown in both ridges on the 10th April 1844, and ing had the crop thrashed from each ridge, keeping each quan- r carefully apart, I found the produce of No. 1 to be 12 bushels ecks, and of No. 2, 12 bushels ¾ peck. The straw on each s apparently so nearly alike, that I deemed it unnecessary to ertain the quantities.

To render the foregoing statement sufficiently explicit, I sub-

join a schedule of the entire experiments, on the scale of an imperial acre :—

Ridges.	Manures for Turnips.	Produce of Turnips.			Barley.	
					Sown.	Reaped.
		tons.	cwt.	lbs.		
No. 1.	13½ tons of Farm-Yard.	22	0	0	3 bushels.	48¼ bushels.
No. 2.	13½ tons of Farm-Yard.	20	16	24	3 bushels.	44½ bushels.
						3¾ bush. in favour of No. 1.

The turnips were stored, when removed, in this manner:—Those from No. 1 were put, in November 1843, into a heap of six or seven feet in breadth, covered with as much straw as would prevent the earth mixing with them, and the earth was placed above the straw about four or five inches in thickness, and well clapped down with the spade on each side, but leaving a space along the ridge, of about one foot, merely covered with straw, to permit a free ventilation, there being less cause of fear from the effects of frost than from what is here locally termed *self-heating*. The turnips thus stored were good in June; at the same time it was necessary to use means to check their vegetation about the middle of May, which was done by removing the earth, and having the turnips turned over, and either renewing the original covering, or using straw only, and this precaution I have found necessary in other modes of storing.

The turnips from No. 2, in March 1844, were covered with a thick layer of straw, and seemed in as good a state of preservation, but the cattle did not eat them so readily as those of No. 1.

*Counter-Remarks on "Remarks on Mr W. K. Brown's Statement regarding the Hypothesis of Malthus."**—In offering two or three counter-remarks on the foregoing, Mr Brown acknowledges the candour of the writer in propounding his views. He equally admits that "a writer on statistics, of all men, should be careful not to assume incorrect data as the basis of his calculations, more especially while attempting to prove by them the fallacy of his opponents' arguments." But, with this admission, was not Mr Malthus at least *obscure* in laying the foundation of his arguments as regard population and production? Placing, however, the hypothesis *in nubibus*, (perhaps its best position,) it is clear that he so far "under-estimated the power of increased

* Farmers' Note-Book, Journal of Agriculture, No. V. for July 1844.

ıltural production," that it is proved that, while he stated population progresses as 1, 2, 4, 8, and provision only as 3, 4, that provision has *mainly* in England kept pace with ation from 1791 to 1841—fifty years, and will keep pace it for fifty years to come, by improved cultivation, unless ted in its progress "by the insane views and projects of the political economists."

-adverting to the point at issue, whether Mr Brown has nstrued Malthus as to compound ratio of increase of popu- ı or not, *which is matter of opinion*, he, Malthus, clearly d his axiom, that each twenty-five years' population advanced to 8 and provision only as 1 to 4, that is, that every ;y-five years the former *doubled* the latter, whereas it is d, by *practical* evidence, that population and provision 'y kept an equal ratio from 1791 to 1841—fifty years, e the period laid down in the Malthusian hypothesis. The nate end, therefore, of "Protection to Agriculture" being *ısed production*, it does not appear but that, with the con- ncies propounded by Mr Brown, the *ratio* of population and sion will, he repeats, go on from 1841 to 1891, as was the 'rom 1791 to 1841, under an adequate scale of protection as st the foreigner.

use of the Appearance of the Sorrel Plant in Grass-Land.— ıg the past extremely dry summer, I observed that the pas- and meadows (but particularly the former) in the vicinity verpool abounded with an unusual quantity of sorrel run- to seed; in fact, some pastures were completely red with ılant. The reason why the sorrel was apparently more exu- t this year than in others doubtless arose from the circum- e of the stunted growth of the herbage in spring permitting lants (always existing in the soil) to a freer access to the light and atmosphere; and having outgrown the surround- :asses, still further injured the farmer by shading the herb- 'om the sun and air, thus inflicting a double injury. I have ined the soil from a great number of fields this summer, ,) and in all cases have found the sorrel abound precisely ı proportion of the free humic acid in the soil; and as the ly is now known, viz., the use of calcareous manure, which ıe had abundantly and cheap in Liverpool in the shape of ıakers' waste, (*carbonate of lime*,) it will be an unpardon- ıeglect if the farmers in that vicinity do not extirpate this sorrel) from their pastures in future. Interest alone ought luce them to do so, as I am convinced that a great amount sture-land, in the neighbourhood just mentioned, would be ıently increased in value, at least 50 per cent., by such an

application. Another matter is worthy of remark, namely, that where persons are situated in the midst of bogs, such as Chat-moss, &c., and no other water to be procured than bog-water, by putting a small piece of lime, or, better still, a little lime-water sufficient to neutralize the humates, such water may be made perfectly pellucid and palatable.

Steeping of Seeds. By Mr Towers.—Mr James Campbell of Dundee exhibited, in August 1843, several specimens of corn grown from seed that had been steeped in chemical solutions, and then made a communication to the Highland and Agricultural Society, which was published in its Transactions. The society recurs to this communication at page 239 of their Transactions for January 1844; and, under those circumstances, it appears perfectly legitimate to offer the following remarks upon the subject, to which attention has been thus solicited:—

It fortunately happens that I (for, when we come to direct evidence, it appears meet to lay aside the plural number) have been empowered to express myself, to some extent, practically, inasmuch as a selection of the materials had been sent to me, in order to give our Berkshire farmers an opportunity to make trial of their properties during last spring. They, however, arrived too late for any kind of corn, with the exception of barley, a considerable quantity of which was not in the ground till after the middle of April. All the beans, pease, oats, and spring wheat had been sown long before the materials reached this quarter.

The first point to be ascertained was the innocence of the liquids when prepared according to the printed direction, and this I was enabled to do by steeping barley during forty-eight hours, and immediately drying the seeds in the air. They were then sown in a box, side by side with other grains of the same specimen that had not been prepared in any way, yet both germinated about the same time. I also took some prepared seeds to the farmer from whom I had the barley, and sowed them in a garden-pot standing in his parlour window. He witnessed their germination in the course of ten days, and then became a purchaser of a quantity sufficient to steep four bushels.

This neighbour and four other persons only have been induced to experimentize for themselves, all the others either fearing or declining to touch an untried novelty!

I mention these local facts to prove the indifference of English agriculturists to science. They murmur—they insist upon protection—they talk of the shortness of crops, of high rents, bad seasons, and desolating losses; yet are content to remain in ignorance (ignorance, when compared with the enlightened

iews and zeal for discovery of the Scotch farmer) rather than bring to the test of experiment what might replenish their barns with superabundance.

Having certified, by two or three direct experiments, that the steep for barley, if properly used, is innocuous, it appears right, during the pending trials of its efficacy, which it seems have been extensively in progress, to solicit attention to the proposals of Mr Campbell, and to the theory upon which he bases his expectations, for a good deal of error and misconception are evidently afloat on these points.

Referring to the report, "On the Effects of Soaking Seeds in Chemical Solutions," (Trans. p. 155, No. 3, Jan. 1844,) we find the following paragraphs, which are cited according to their importance, and not in the order in which they occur. Mr Campbell says—

1*st*, I steeped the seeds of the various specimens exhibited in sulphate, nitrate, and muriate of ammonia, in nitrate of soda and potass, and in combinations of these, and in all cases the results were highly favourable. For example, seeds of wheat steeped in sulphate of ammonia on the 5th July, had by the 10th of August, the last day of the Show at Dundee, tillered into nine, ten, and eleven stems, of nearly equal vigour; while seeds of the same sample, *unprepared*, and sown at the same time, in the same soil, had not tillered into more than *two*, *three*, and *four* stems.

The tillering of wheat depends greatly upon the distance of the plants. I had a row of wheat in my garden sown expressly, in October 1843, with a view to watch the results of dibble-sowing. The ground had received no stable manure, nor any other dress, excepting a very slight sprinkling of pounded bones, and a little leaf-soil. Each hole was made eight or nine inches remote from its neighbour, and, finally, but one plant only was suffered to remain in it. Last summer I found five to ten tillers on every plant. A strong argument this against the squandering of the seed, which permits eight or ten plants to rise within the compass of three inches, to the uncompromising injury of the whole. The only alleged excuse for thick sowing is the possible loss of plant through vermin and decay of seed; but I did not lose a grain, though, in consequence of the profuse rain of spring and autumn 1843, my garden was absolutely pestered with snails and slugs. If Mr Campbell's steeps add to the tillering developement, (and experience will soon ascertain this,) a stronger argument is thereby produced for the *economy of seed*.

I will now examine the nature and composition of the various materials which are stated to have produced effects most gratifying and extraordinary—

1*st*, *Tall Oats*.—These, averaging 160 grains on each stem, and eight available stems from each seed, were prepared from *sulphate of ammonia*, the other specimens of oats, which were the most prolific, were from muriate of ammonia, and the promiscuous specimens of oats were from nitrates of soda and potass—strong, numer-

ous in stems, (some having not less than fifty-two,) and not so tall as either of t
preparations from the sulphate or muriate of ammonia.

From the facts here adduced, it appears that, from some pr
paration of ammonia, the best or most marked results were o
tained; therefore we have every right to investigate the caus
of these results.

Mr Campbell has evidently looked to principles, for he th
expresses himself at p. 156:—

> It is now a considerable time since I began to imagine that if the *ultimate* prin
> ples of which the proximate constituents of most of the gramineous seeds are co
> posed, could, by any possibility, be made so to enter into the substance of the se
> and at the same time not to injure its vitality, as thoroughly to endue its text
> with an excess of these principles, the end would be accomplished.

We shall not attempt to enter into any consideration of t
minutiæ of proximate or ultimate elements. The atomic system
all very well in the study of the philosophic chemist, but to t
farmer it must suffice to state that the seed of all the gr
crops, of wheat in particular, abounds with a principle cal
gluten, which gluten (one of the chief *proximate* elements) c
tains nitrogen or azote, detected by energetic chemical analy
and, therefore, is to be considered an *ultimate* element of the se
The material employed as a steep for wheat and barley i
chemical salt or salts, of which *ammonia* forms the basis, a
ammonia is proved to be resolvable into hydrogen one part, a
nitrogen three parts. Ammonia is decomposable by *electric*
and electricity is evolved (though not always visibly) du
chemical changes effected by the decomposition of water.

The theory then implies that, if a salt containing nitrogen
so applied to a living seed as to combine its organization w
some of its own elementary constituents, it will, in all probabi
rather stimulate the vital principle than in any degree lower
paralyze it; and if the albumen of each grain be made m
redolent of its most nutritive constituent, all other conditi
remaining the same, it reasonably follows that the seed so p
pared must be endowed with increased power of nutrition.

Let any one sow the seed of wheat or barley, and, from tim
time, take a growing plant from the soil, and he will perc
how tenaciously the husk remains attached to the plant, at
part where the root and plumule both unite, until the whol
the meal be absorbed from it. If then that meal be furni
with an extra supply of its chief element, it will follow that
seed itself has been rendered a receptacle of manure or nu
ment. Under this view of the first processes of nutrition,
Campbell was fully justified in writing that

> The discovery, therefore, of a process by which the cereal and other grami
> seeds might be obtained in extraordinary abundance, without the use of manu

certainly a great desideratum. Now this desideratum, however strange it may appear, I have good grounds for concluding I have obtained.

If ammonia be in reality the medium through which seeds and plants are supplied with *nitrogen*, it is evident that an ammoniacal steep ought to be preferred; and this we find to be the case in the barleys raised by Mr Campbell, though he employed salts of *potassa* and *soda* occasionally. But in these also he had *nitrogen*, in the nitrous acid, whenever he employed the *nitrate* of *potass* or *soda*. Ammonia can be and is decomposed by electric action; but the chemist fails in his attempts to produce ammonia by the actual union of its constituent elements—hydrogen and nitrogen; but this inability to form ammonia by art presents no obstacle to the energy of vital action; and, therefore, we may suppose that, if the ammoniacal or nitrous steeps operate favourably upon seeds prudently soaked in them, the *vital agency of the germinating plant* produces first decomposition, and then an immediate union of the elements at the moment of their developement, in due proportions to meet the exigencies of the progressing organization.

This power or increased energy, if we are not much deceived, it is Mr Campbell's object to prove. Persons who have read his article lightly, or who are totally ignorant of chemical principles, have concluded that he aims at getting rid of *manure* altogether; but that this is not the fact, the following paragraphs will clearly evince. We admit it to be true that he exhibited specimens grown in earth which had received no "manure of any kind for the last *eleven* years," yet there is no ground to suppose that manures are thereby repudiated—far from it. On the contrary, page 158, he observes—

> At all events, from the experiments which I have already tried, I am quite satisfied that, even *without* the application of common manures, double crops at least may thus be raised, and *under the application of the ordinary manures*, crops tenfold greater than usual.

Again, in the hand-bill which accompanies the boxes—

> After impregnation with these liquids, the seed *possesses within itself* elements which not only afford additional nourishment to the grain during germination, but communicate to the expanding vessels of the plant an aptitude to absorb food, both from the soil and the atmosphere.

The inference fairly to be drawn is this:—If no manure be present, the crop will thus be increased two fold; if the ground be duly enriched the prolificity will be greater to a very surprising extent. I am not very apt to take a theory and pretended discovery upon trust; but, having, *de facto*, proved the innocence of the barley steep, and having witnessed daily the healthy condition of the plants from a certain number of seeds, every one of which germinated, I am satisfied, so far as time and circumstances have,

by any possibility, enabled me to proceed; and, as a friend to agriculture, I can only regret that so few have ventured to spend a few shillings in the prosecution of an inquiry which might, in five months, have placed its results beyond the reach of doubt. In the garden I have tried very old cabbage seed, asparagus of 1843, and two out of four rows of pease, but so dry, nay, parching, was the past season, after twenty-four days of all but cloudless sun, that germination hardly proceeded. The question concerning turnips still, however, remains open: and I hope Mr Campbell will bend his attention to it. I will add a fact, just come to light, which was little noticed at the time, but has received importance from the publicity just given to Mr Campbell's discovery. A near neighbour, for mere curiosity, steeped a sowing of the buff kidney beans for above twenty-four hours in a weak solution of sulphate of ammonia, mixed with a small quantity of nitrate of soda. He dried the seeds, and sowed them in pots under glass. They vegetated perfectly, and developed a foliage so powerful, and of so rich a hue, as to create surprise. The blossoms and seeds were in proportion excellent, and thus proved prolific.

Azote or *Nitrogen* has risen, of late years, into vast consequence, as an ultimate element of vegetable structure; and every albuminous seed abounds with it, the fixation of nitrogen in the seed appears to be one of the grand final processes of vegetable function. The impregnation of seed with a decomposable azotized compound, in this view of the subject, is a question of no ordinary interest. It should appear that all the benefit that is observed to attend the use of nitrate of soda is dependent upon the nitrogen which is developed from the nitric acid of that salt. I have witnessed the effect of steeping p[...] in nitrates—they began to vegetate rapidly; but had pure [...] or nitrous acid, been employed separately, vitality would [have] been injured; whereas it is evident that, when employed [in a] state of perfect neutrality, as in the weak solutions used by [Mr] Campbell, the seeds not only remain safe, but are prepare[d to] vegetate speedily, and with greater vigour.

The same principle applies to ammoniacal salts. [...] months since, I myself steeped seeds of wheat in a very weak alkaline solution of sulphate of ammonia, prepared from carbonate direct, by addition of dilute sulphuric acid. [The] alkali, however, was not quite subdued, and the consequence [was] the total destruction of the seeds. Not one grain, though [placed] in a warm stove, shewed the least sign of germination.

August 1844.—Since the foregoing was written, some o[pport]unity has been afforded, to a very partial extent, of bringin[g Mr] Campbell's preparation for barley to the test of experie[nce]

e instances, by parties residing at considerable distances one n the other.

Three of our Berkshire farmers were prevailed on to try a icient quantity to steep five or six bushels of seed, according he printed direction sent with the material, which was evitly composed of nitrous salts. The experiments are numed as they occurred.

No. 1 was conducted in a large common field, the subsoil of ch, at unequal depths, is a harsh burning gravel; the upper tum a hard indifferent loam, but generally manured by iberal hand. Three bushels, and two bushels and a-half teeped barley, were sown in drills, side by side, of unsteeped d; the latter to the usual extent of four bushels. The time, ril about the second week. Both rose well, but our drought l set in, and continued with a burning sun for ten weeks. on a soil so drained and heated, the plants could not make at advances, and in those places where the gravel is near the face, it was wretchedly thin. I inspected the plots or lands they ranged side by side, in the beginning of August, and in npany with the man who sowed the barley. We both consied the crop as weak upon the whole, an inevitable result of drought, but that the plant from the steeped seed equalled t from the unsteeped, and, therefore, that the seed saved was far a real economy.

No. 2, by an immediate neighbour, consisted of two broad lands ntiguous to others of unsteeped barley. The ground of steeped s a strong, heavy, binding loam; and in the second week of pril already baked into unmanageable clods before the seed s sown. Not one-third vegetated at all, till the rain fell on e 1st July; hence the experiment was a complete failure. owever, the few steeped plants have tillered well, and the ears e well filled. The plants from the unsteeped, owing to the tances at which they stand, have also tillered well; but we n arrive at no comparative decision whatsoever.

No. 3 is, however, decisive. The land chosen being naturally ist, good in quality, and seated upon a cool clayey subsoil, rked favourably, received and sustained its plants extremely ll. An acre, or thereabout, was sown with two and a-half bushels barley steeped sixty hours and dried; side by side of this, a row intervening, a plot was sown on the following day, with rley unprepared, at the rate of four bushels per acre; the riod about mid April. In the end of July I saw both, accomnied by the farmer, who would not let me know where they re situated till I arrived at the field. He then put the quesn, "Do you see any difference?" The plants from the steeped d exhibited a breadth of rich intense verdure, surmounting

in height by full three inches. Every space was filled, every ear full, and we counted some with seventeen seeds in a rank. The tillering was ample, and in every respect the product was superior to that from the four bushels of unsteeped seed. One experiment, however propitious, cannot be conclusive; yet, so far as it goes, it is undeniable. The season had been adverse, and we must wait for further evidence. It appears, however, that soil and subsoil exert considerable influence; and, therefore, it follows that much time and assiduity will be required to effect the object of the inventor.

November 1844.—Very few experimental facts have been obtained from any quarter concerning the results of Mr Campbell's preparations for steeping seeds since the foregoing observations were penned. The only printed article of any moment is that of Captain Barclay Allardice, in the form of a letter to the editor of the *Mark Lane Express*, of date October 26. That gentleman tells us that, "from *three* acres steeped oats, but sown at the rate of four bushels per acre, the return is 14¼ quarters; while from two and a-half acres unsteeped, the return is exactly 20 quarters, being 3 quarters 1 bushel in favour of the unsteeped, or 60s.—double the rent of the land per acre." This last piece was sown at the rate of *six* bushels per acre. So far as this part of the experiment goes, it might pass as a complete swamper of the whole theory of steeping, but a qualification is given in the following lines:—"I am satisfied, had I sown Mr Campbell's steeped seed at the rate of 6 bushels per acre instead of four, the returns from the steeped and unsteeped would have been about the same; there is no rational reason that it should not have been so, the land being exactly the same quality and equal justice done to the whole." Thus the value of the steep is just reduced to nothing, in point of efficacy;—according to the above paragraphs, it is at nought, a mere cypher; and in that case the farmer would be unwise to spend his money for that which must prove a "chip in porridge." But direct experiment here, in Berkshire, proved (as before recited) that a large plot of steeped barley, sown more thinly and close, side by side of another and still larger of unsteeped, had exhibited so marked, so strong a superiority, that no observer could doubt or mistake. As to thin sowing, the powerful evidences of Mr John Morton, Mr Hewitt Davis, Mr Mechi, men of fervent zeal, and much devotion to the cause, are answers in full to the single instance above cited. Be this as it may, Captain Barclay finally observes that, as to thin or thick sowing, what Mr A. or B. may find sufficient in their land can be no *general* rule whatever." "A farmer must regulate his seeding by his own experience and observation," &c. *True*, experience must finally decide in minutiæ and local peculiarities. B[illegible] societies, colleges, large influential bodies, ably and consist-

directed—(and such are forming, may we soon see them ;hout the land !)—it is for such to experimentize rigidly, report well-attested results in all sites, upon every attain- ›rt of land, and by all feasible appliances.

great obstacle to the extension of Mr Campbell's experi- is the high price of his materials ; it places them out of the of farmers, who complain that they have no means left to y rent at all. Mr Campbell would do well, if he feels ·ized so to do, to bring forward some unquestionable proofs reased production *in the field*, and then offer his chemical als—most of which could be purchased under 30s. per cwt. › price much nearer to that rate: 3s. 4d. per bushel for is apt to startle. Not one farmer in Berkshire could be ıded to try a few pounds prior to the late wheat season.

there is another point of great importance to the sower, if it can be established, will be very interesting to the '. *Seeds steeped* forty-eight or sixty hours, and left dry for ıight, being tested by moistening them superficially with *of potassa*, yielded a powerful odour of ammonia, and also :ed the white fumes of sal-ammoniac vapour, on the ap- . of muriatic acid. The seeds then *are* and *remain* impreg- with nitrogenous and pungent salts, perhaps to an extent ›hile their vital germ remains intact, qualifies them to repel 'ages of the wireworm. A hint was given in October at a meeting in Scotland much to the same effect.

season has passed away without a trial; let us hope that ıing may be done to give assurance prior to the sowing of corn. Here, in England, the drought departed in the middle tember ; since then profuse rains have deluged the land, and artially retarded wheat sowing beyond the present date. have been no frosts, even of three hours' duration, to this and every little rime has passed off with almost immediate The barometer has been unusually low for a month. The e temperature very mild.*

ging Wheat. By Mr Main, Chelsea.—To Mr Taylor's nt practical paper on reaping and mowing corn, which s in the Transactions, I would beg leave to add a few :s, for the purpose of stating how the same labours are ed in the south of England, at least in what they differ ıe methods so well described by Mr Taylor's facile pen.

·actice of mowing wheat was begun among some few small farmers, above

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two postscripts have brought the subject of this paper to a recent date. ıer part of the paper has been in our possession since last May. The printed ts of Mr Campbell himself, noticed in the *Gardeners' Chronicle* and *Agri- Gazette* of the 9th December 1844, are notmore favourable to his steeps than ding relation of facts.—Editor.

forty years back, and at this time begins to be adopted by many individuals of the higher classes who approve its utility, as abridging the labour of harvest, and consequently, reducing the expense. But though reaping with both the serrated and smooth-edged sickles is continued by many labourers, yet the most common practice is that called *bagging*, which, if it be not what Mr Taylor calls *cuffing*, is not described by him. In a circle of forty miles diameter round London every inch of straw is valuable, and, therefore, the lower the crop is cut the better is the owner pleased. To assist this method of reaping, the surface is made as smooth as possible by rolling in the spring. The bagging hook is rather a heavy tool, resembling a furze-hook rather than a reaping-hook. The blade has a regular gentle curve, is twice the breadth of a toothed sickle, and broadest near the point. The neck is raised obliquely upward; the handle, of course, is also raised at a convenient angle from the place of the blade. The handle has a wrist-strap attached.

With this powerful tool, which is kept keen with a whetstone, each workman takes a drift at the left hand side of the crop, with his back to the wind. He first makes a band as usual, and holding a wisp in his left hand, with which he holds back the straw he means to cut, he gives a sweeping blow with the hook close to the ground, clearing a space of about three feet into the standing crop, against which that which is cut is left leaning. Stepping forward, the blows are repeated at every fall of the foot, until he reaches the other side of the drift; at which point he turns and steps backward, collecting with the hook all that is cut against his left knee and arm, the right foot being at the same time employed to keep the butt square and even. Regaining the furrow or point where he began, he with the hook underlifts the whole clear off the ground, and lays it upon the band ready to be bound. Thus one sheaf is made, and the same action is repeated along the whole length of the drift. The drifts are usually about four steps wide, more or less, according to the width of the lands or thickness of the crop.

It is surprising how quickly an active man gets over the ground by this mode of reaping. By some farmers bagging is objected to, because all the undergrowth, weeds, &c. are cut and carried to the barn with the wheat, and thereby causing extra trouble to the barn-men. Others approve of it, for this very reason, that the seeds of weeds, being collected in the barn, are easier got rid of than if left to grow again in the field. Bagged sheaves, by being cut close to the ground, are larger and require more field room than reaped sheaves cut from a high stubble; because they are free from the extraneous matters which the bagging hook collects. Heavy crops, which are much laid, and which is a frequent circumstance in the metropolitan counties, could not so easily and so well be got off the ground, were it not for the well wielded bagging hooks.

Every description of reaping and mowing in the south of England is done at so much per acre, according to the bulk or fair standing of the crop; the amount of work performed, and the time required being nearly the same as in Aberdeenshire. Labourers, whether at reaping or mowing, find their own food; but each has a daily allowance of both ale and small beer.

AGRICULTURAL REPORT.

December 1844.

The weather during the last quarter has, upon the whole, been very favourable to field operations. The potatoes were taken up in excellent condition during the early part of October, and proved themselves a prolific crop of good quality. The potato land was afterwards ploughed up with all expedition, and sown with wheat in the best state. For a fortnight at the end of October and beginning of November the weather changed to heavy wind and rain, accompanied with intense cold; indeed the wind blew at times a perfect hurricane, and occasioned much damage to the shipping on the eastern coasts of both Great Bri-

t and Ireland. In consequence of this storm the land became
roughly drenched, and the springs were opened for the first
e; but with the means now put in practice to rid the land of
er, the ground soon assumed a condition fit for the plough,
for the reception of winter wheat. Since the commencement
December, heavy hoar-frosts have covered the ground every
ning, and, as a natural consequence of this phenomenon,
ch is always accompanied with a still atmosphere, a dense
enveloped the towns, while the air in the country became
r and bracing, sharpened with from five to ten degrees of
t. There is no great harm in laying ploughs idle for a few
s in this the dormant season of vegetation, as supplying stock
the field and steading with food and litter affords ample
loyment to man and beast. Just before the frost set in
a favourable opportunity for storing turnips, and he who
not then embrace it, was certainly guilty of neglect. The
l and dry autumn has secured a good crop of turnips for
winter, so that it may reasonably be anticipated that stock
be in high condition in spring. This, coupled with a great
ciency in the turnip crop in England, holds out the prospect
Scotch feeders finding in the English markets a ready sale for
ir well-fed meat. True, the English feeder depends now much
e on oil-cake than turnips, and that succedaneum, mixed
h chopped hay, makes very good feeding for oxen. Still it is
ensive feeding, and the meat it produces cannot compare in
etness and firmness with that from sound turnips, assisted
h a little corn, or bean meal, or oil-cake. One advantage the
tch feeder possesses this season, and it is a great one, which
he putting up of his stock to feed in fine fresh condition, the
rmath having turned out uncommonly good.

The stock markets this fall have presented a varied character.
e last of the Falkirk Trysts, the one in October, was fully
plied with cattle and sheep, but keep seeming short in Eng-
l, the demand from that quarter almost failed, so that many
eders who presented their stock were either obliged to take
w price or retain their stock. At the subsequent fairs the
y opposite result occurred. Expecting little demand, breeders
plied Doune and All-Hallow Fairs scantily—that of Hallow
ing 3,000 fewer head than last year, and the consequences
e a start in price, and briskness in market; but though
n results are considered favourable in ordinary circumstances,
y proved serviceable to neither breeder nor feeder: because
scanty supply obliged the feeders to buy in at a high rate,
le, by retaining a great part, the breeders did not try to
quit of all their disposable stock. The breeders should
e known that Doune and Hallow are mostly frequented by
ners who raise turnips, and delay purchasing their winter

stock as long as they possibly can; and not being speculators, the south country buyers, who frequent Falkirk, seldom purch so early as even the last Falkirk Tryst, they did not reap advantage of the low price then going.

The grain markets are very steady; and, although wheat c tinues to decline, the fall in price is very gradual. The aggreg average price is now 45s. 10d. per quarter. The quantity Scotch wheat in the market is but small, owing to its state, be yet unfit for use, and its quality is by no means so good a tempt buyers to purchase it in a raw condition. The low p of wheat, therefore, indicates that that crop, in the sout England, must have been very fine. Barley bears a much hig price than wheat, comparatively, being 35s. 5d. per quarter. gift in Scotland is good, but the colour is dull, though the we is as high as from 54 lbs. to 56 lbs. per bushel. Oats, too, a higher relative price than wheat, being 21s. 7d. per qua A simple glance at the tables will shew how steadily the pric grain have ruled in the home market during the past quarte

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Q ters and Years ended on the 10th October 1843 and 10th of October 1844—ing the Increase and Decrease on each head thereof.

	Quarters ending Oct. 10. 1843.	Quarters ending Oct. 10. 1844.	Increase.	Decrease.	Years ending Oct. 10. 1843.	Years ending Oct. 10. 1844.	Increase.
	L.	L.	L.	L.	L.	L.	L.
Customs, ...	5,529,508	6,002,855	473,347	. .	18,520,340	20,213,505	1,723,165
Excise, ...	3,966,550	3,900,890	. .	5,560	11,780,044	11,939,942	173,898
Stamps, ...	1,650,366	1,665,688	15,322	. .	6,464,256	6,533,385	69,129
Taxes, ...	194,100	201,439	7,399	. .	4,207,792	4,264,853	. .
Post-Office, . .	160,000	200,000	40,000	. .	590,000	672,000	82,000
Miscellaneous, .	37,844	230,961	193,117	. .	1,871,861	831,357	. .
Property Tax, .	2,047,904	1,958,711	. .	89,193	5,052,057	5,158,470	106,413
	13,586,272	14,220,544	729,185	94,753	48,492,350	49,583,512	2,154,605
	Deduct Decrease,		94,753	.	Deduct Decrease,		1,043,443
	Increase on the Qr.		634 32		Increase on the Year,		1,111,162

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.
1844.						
Sept.	Danzig.	23/ to 33/	18/6 to 23/6	8/6 to 11/9	16/ to 19/	22/ to 25/
Oct.	..	26/6 32/3	21/ 26/	8/9 12/	16/ 18/6	23/ 26/
Nov.	..	23/ 30/6	23/ 27/9	9/ 12/6	18/ 21/	23/6 27/6
Sept.	Hamburg.	29/6 34/3	20/ 26/3	6/3 11/6	17/6 20/	24/ 27/
Oct.	..	28/ 32/3	19/6 25/9	6/ 11/3	18/6 21/6	24/ 29/
Nov.	..	30/ 34/6	24/ 29/3	8/6 12/6	19/ 22/	25/6 29/3
Sept.	Bremen.	38/ 42/	18/6 22/6	9/6 12/	18/6 21/6	22/6 25/6
Oct.	..	36/ 40/	19/ 21/6	10/6 13/6	19/3 23/	24/ 27/
Nov.	..	37/ 40/6	20/ 26/	10/ 12/6	18/6 22/6	25/ 29/
Sept.	Königsburg.	30/ 33/6	17/6 22/	10/ 12/	17/6 20/	21/6 24/
Oct.	..	32/ 35/6	19/ 23/	11/6 14/	18/ 21/	22/6 26/
Nov.	..	34/ 38/6	21/ 25/6	13/6 15/6	19/6 23/	24/ 28/

Freights averaged from 3/ to 5/ per quarter to Great Britain.

TABLE OF PRICES, &c.

es of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets :—

LONDON.

arley.	Oats.	Rye.	Pease.	Beans.
s. d.	s. d.	s. d.	s. d.	s. d.
36 2	20 2	34 6	35 8	35 5
38 5	20 10	34 9	34 9	33 8
38 9	21 1	35 6	33 2	34 9
37 6	21 4	36 4	33 6	34 0
36 6	21 3	36 10	33 10	33 5
36 0	21 4	37 4	34 6	37 0
35 8	21 7	37 9	34 10	34 9
36 4	21 8	38 2	35 4	34 6
37 0	21 11	39 0	35 6	34 9
30 11	22 0	37 6	34 8	35 8
30 0	22 4	34 6	35 2	35 5
36 7	22 8	33 4	35 8	36 3
36 6	22 10	34 1	35 6	36 8

LIVERPOOL.

arley	Oats.	Rye.	Pease.	Beans.
s. d.	s. d.	s. d.	s. d.	s. d.
29 2	19 6	34 9	34 6	35 0
32 6	19 7	35 7	34 2	36 9
33 4	19 9	35 6	33 4	38 3
31 6	19 10	35 9	33 6	36 9
33 6	19 4	36 6	34 1	40 7
32 0	19 9	37 2	34 4	38 6
30 2	19 8	37 10	33 9	35 6
33 4	19 4	37 6	33 6	39 6
32 9	19 9	36 8	34 4	41 0
31 3	20 6	35 9	34 9	39 5
34 8	20 5	35 2	35 4	39 3
34 5	20 2	34 8	35 0	43 5
34 9	20 6	35 1	35 6	42 2

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1844.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 4.	56 10	31 8	23 1	38 0	38 6
11.	60 8	30 2	21 7	37 6	38 1
18.	50 7	31 4	22 1	38 0	39 0
25.	50 6	31 6	21 10	38 0	38 7
Oct. 2.	47 5	29 1	20 1	39 0	39 7
9.	52 1	31 7	22 8	39 2	39 6
16.	53 5	32 4	22 4	38 8	39 1
23.	53 2	29 9	20 2	38 4	39 5
30.	49 8	33 5	21 8	38 0	38 4
Nov. 6.	48 1	31 4	20 1	37 6	38 1
13.	48 2	32 11	21 4	35 2	35 7
20.	46 8	31 10	20 8	36 2	38 9
27.	46 2	31 6	20 1	37 2	37 6

DUBLIN.

Date.	Wheat per Barrel 20 st.	Barley per Barrel 16 st.	Bere per Barrel 17 St.	Oats per Barrel 14 St.	Flour per Barrel 9 St.
1844.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. 6.	21 11	15 7	12 2	10 11	16 0
13.	25 0	15 4	12 3	10 9	15 10
20.	24 5	15 3	12 1	10 11	15 9
27.	22 0	15 9	12 0	10 3	15 8
Oct. 4.	21 10	15 5	12 2	10 2	15 10
11.	22 8	15 11	12 6	9 9	15 8
19.	22 0	15 7	12 3	9 10	15 7
25.	22 4	15 0	12 0	10 0	15 6
Nov. 1.	23 11	16 0	12 8	10 6	15 4
8.	25 0	16 3	13 2	11 1	15 6
15.	25 2	16 0	13 0	11 2	15 0
22.	25 0	15 9	12 10	10 10	15 10
29.	25 3	15 11	12 9	11 2	16 2

he Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV., Vict., c. 14, and the Aggregate Averages which regulate the Duties payable on ORN: the Duties payable thereon, from September to December 1844.

Duty.	Barley. Weekly Average.	Barley. Aggregate Average.	Barley. Duty.	Oats. Weekly Average.	Oats. Aggregate Average.	Oats. Duty.	Rye. Weekly Average.	Rye. Aggregate Average.	Rye. Duty.	Pease. Weekly Average.	Pease. Aggregate Average.	Pease. Duty.	Beans. Weekly Average.	Beans. Aggregate Average.	Beans. Duty.
s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
20 0	35 9	34 6	4 0	20 5	20 3	6 0	34 4	35 9	7 6	33 10	34 3	8 6	38 1	38 0	6 6
20 0	35 11	34 10	4 0	20 1	20 4	6 0	35 9	35 5	7 6	34 6	34 4	8 6	37 9	38 6	6 6
20 0	35 6	35 0	4 0	20 5	20 3	6 0	35 7	35 6	7 6	33 1	33 0	9 6	37 3	36 11	6 6
20 0	34 5	35 2	4 0	20 6	20 5	6 0	37 3	35 7	7 6	33 2	33 8	9 6	36 8	37 1	5 6
20 0	33 9	35 1	4 0	20 5	20 6	6 0	37 5	35 9	7 6	33 5	33 7	9 6	36 6	37 3	5 6
20 0	33 6	34 10	4 0	20 6	20 5	6 0	37 10	36 4	6 6	34 2	33 6	9 6	36 11	37 2	5 6
20 0	34 0	34 6	4 0	20 8	20 6	6 0	38 0	37 0	5 6	33 10	33 7	9 6	36 9	37 0	5 6
20 0	34 9	34 4	4 0	20 11	20 7	6 0	39 3	37 7	5 6	34 2	33 8	9 6	37 0	36 10	6 6
20 0	35 7	34 5	4 0	21 2	20 8	6 0	37 3	37 10	5 6	35 1	33 11	9 6	36 8	36 9	6 6
20 0	36 1	34 7	4 0	21 6	20 10	6 0	34 6	37 4	5 6	34 7	34 2	8 6	37 11	37 0	5 6
20 0	35 9	34 11	4 0	21 9	21 1	6 0	34 2	36 10	6 6	35 7	34 6	8 6	38 4	37 3	5 6
20 0	35 2	35 3	3 0	21 1	21 3	6 0	30 0	35 8	7 6	36 2	34 11	8 6	38 6	37 6	5 6
20 0	35 1	35 5	3 0	21 8	21 7	6 0	32 2	33 4	9 6	35 11	35 7	7 6	38 0	37 10	5 6

*The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the (
Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month;
upon which duties have been paid for home-consumption, during the same Month; a
tities remaining in Warehouse at the close thereof, from 5th September 1844 to 5th Dec*

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN W.	
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions
Sept. 5, 1844.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs.
Wheat, .	125,670 4	7,270 4	132,941 0	137,341 4	6,771 5	144,113 1	331,274 5	619
Barley, .	153,988 7	4,931 3	158,920 2	93,116 5	4,931 3	98,078 0	164,681 1	. .
Oats, . .	80,624 4	1,349 3	81,973 7	64,258 1	1,310 7	65,569 0	86,855 2	38
Rye, . . .	1,905 4	. .	1,995 4	7,034 1	. .	7,034 1	2,546 0	. .
Pease, .	35,375 7	2,411 2	37,817 1	73,311 4	2,223 6	80,570 2	2,749 6	211
Beans, .	30,154 2	. .	30,154 2	105,635 1	. .	105,635 1	4,810 0	. .
Totals,	427,709 4	15,992 4	443,702 0	480,757 0	15,242 5	500,999 5	591,809 6	869
Oct. 5, 1844								
Wheat, .	77,323 0	7,889 6	85,212 6	20,568 2	8,335 0	28,903 2	365,920 0	155
Barley, .	161,197 2	1,412 2	162,609 4	133,260 7	1,412 2	134,673 1	196,673 3	. .
Oats, . .	48,548 3	1,392 7	49,941 2	40,199 3	1,438 4	41,637 7	92,949 6	. .
Rye, . .	11,817 2	. .	11,817 2	1,148 1	. .	1,149 1	13,155 1	. .
Pease, . .	11,905 3	1,768 4	13,673 7	6,588 7	1,980 6	8,569 5	7,000 7	0
Beans, . .	15,492 5	. .	15,492 5	7,569 5	. .	7,549 5	15,096 6	. .
Totals,	326,283 7	12,463 3	338,747 2	209,335 1	13,166 4	222,501 5	690,783 7	155
Nov. 5, 1844								
Wheat, .	35,893 5	492 3	26,386 0	17,575 5	516 4	18,092 1	363,210 6	161
Barley, .	80,267 2	151 7	80,419 1	268,865 0	151 7	269,016 7	9,793 7	. .
Oats. . .	19,353 5	212 0	19,565 5	21,100 3	212 0	21,312 3	87,741 5	. .
Rye, . .	710 0	. .	710 0	507 1	. .	507 1	13,358 0	. .
Pease, .	3,315 1	88 1	3,403 2	939 4	88 1	1,027 5	8,524 4	0
Beans, .	15,676 7	. .	15,676 7	30,335 4	. .	30,335 4	3,734 2	. .
Totals,	155,216 4	864 3	156,180 7	338,823 1	968 4	340,291 5	456,363 0	161
Sept. 5, 1844.	cwt. qr. lb	cwt. qr. lb.	cwt. qr. lb	cwt. qr. lb.	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb	cwt. q
Flour, .	73,921 0 17	142,207 3 5	216,128 3 22	13,379 0 25	138,520 2 0	151,899 2 25	263,062 1 7	6,985
Oatmeal,	. .	1,289 0 6	1,289 0 6	. .	1,325 2 22	1,325 2 22	7 3 18	2
Totals,	73,921 0 17	143,496 3 11	217,418 0 0	13,379 0 25	139,846 0 22	153,225 1 19	263,070 0 25	6,987
Oct. 5, 1844								
Flour, . .	29,281 2 1	178,554 2 9	207,836 0 10	2,159 1 3	166,147 0 26	168,306 2 1	278,016 3 4	18,929
Oatmeal,	26 2 12	1,523 1 0	1,549 3 12	26 2 12	1,523 1 0	1,549 3 12	7 3 18	2
Totals,	29,308 0 13	180,077 3 9	209,385 3 22	2,185 3 15	167,670 1 26	169,856 1 13	278,024 2 22	18,931
Nov. 5, 1844								
Flour, . .	14,083 2 16	41,077 3 23	55,161 2 11	2,774 1 24	46,597 1 16	49,371 3 12	257,848 2 27	13,397
Oatmeal,	6 0 0	67 1 19	73 1 19	. .	67 1 19	67 1 19	7 3 18	2
Totals,	14,089 2 16	41,145 1 14	55,235 0 3	2,774 1 24	46,664 3 7	49,439 1 4	257,856 2 17	13,399

PRICES of BUTCHER-MEAT.

Date.	LONDON, Per Stone of 14 lb.		LIVERPOOL, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		P
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Be
1844.									
Sept.	5/9 to 7/9	5/6 to 7/9	5/3 to 7/3	5/3 to 7/3	5/ to 7/	5/3 to 7/3	5/ to 6/9	5/ to 7/	5/3 t
Oct.	5/9 7/9	5/9 7/9	5/6 7/6	5/6 7/6	5/3 7/6	5/6 7/6	5/3 7/	5/3 7/	5/3
Nov.	5/9 7/9	5/6 7/9	5/6 7/6	5/6 7/6	5/3 7/6	5/6 7/6	5/6 7/3	5/3 7/3	5/6

PRICES of English and Scotch WOOL.

ENGLISH, per 14 lb.			SCOTCH, per 14 lb.	
Merino, ...	16/ to 22/		Leicester Hogg, . .	16
in grease, . . .	14/	17/	Ewe and Hogg, . .	14
South Down, ...	17/6	21/	Cheviot, white, . . .	13/
Half Bred, ...	14/	17/	Laid, washed, . .	9/
Leicester Hogg, . . .	17/	21/	unwashed, . .	8
Ewe and Hogg, . .	11/	16/	Moor, white, . . .	6
Locks, ...	7/	10/6	Laid, washed, . .	5
Moor, ...	6/6	8/	unwashed, . .	4/

THE CAUSE OF AGRICULTURE TRULY STATED.

By Mr DONALD BAIN, Edinburgh.

THE active farmer, busy with the details of his farm or his hirsel, has little time for considering even the value of his own labours in a *national* point of view; all that he can think of is how to make them pay as a personal matter. This is, perhaps, the best policy of the farmer; but, in order that he may be allowed to act, or, in all events, have justice, in the fair opinion of the country and the fair protection of its laws, it is absolutely necessary that the value of his labours should be understood, as well as all particulars bearing upon them; or, from the incessant activity of men believing themselves interested to repress agriculture in this country, though very falsely, and turn so far to pasture and importing corn, there is danger that even the most impartial minds may be at last perverted, and the country, with the assent of even its legislators, abandoned to the principle of buying wherever we can buy cheapest, even for the moment, *trusting* to sell as freely the products of one species of labour as we buy those of another.

The author of this paper, exactly ten years ago, delivered himself as follows:—"When a state has been favoured with a soil fit for cultivation, it will be found that its surest, as well as most obvious, source of profit is in the cultivation of that soil." This was his starting note, and he, doubtless, thought well of it. But having shewn his performance to a Mark Lane merchant in corn, he found this very first line underscored, as a complete answer to all and whatever he might have said farther. He denied that we have a soil "fit for cultivation!"

Others will admit that our soil is perhaps cultivable, had we a sun to ripen the produce; and others, again, that we may, by possibility, make something of both, as a Frenchman will make soup of a nettle; but they will say, whatever we produce is bad, and produced at an enormous expense; that we are not naturally an agricultural country, and can never really thrive by agriculture; while from our water-power, coals, iron, &c., we are precisely fitted for manufactures; and in manufactures, were they encouraged, or not borne down in supporting an unprofitable agriculture, we would *beat the world!* These things are said from day to day, and in many quarters believed and pertinaciously and even fiercely acted upon. Should they come to be generally believed, and at last to influence the conduct of government, (and no one knows what may happen, where a question is left so completely hazy as this question in the meantime is,) the result would be most disastrous to this country; not merely to

its agriculturists, but to all classes; and particularly to these very manufacturers who at present so loudly clamour for a change of policy. It would be nothing if these manufacturing gentlemen would contend for cheap and abundant supplies of food, and leave us to find out the means of furnishing them, but they insist upon pointing out also the plan; and "I, even I myself," (as Falstaff has it,) have been declared a perverter of the people, because I would have the country generally closed in by shelter, and the spots in it naturally most barren yet improved as far as improvement is possible. All these things together are, perhaps, sufficient to justify an attempt to put the cause of national agriculture, and internal industry generally, in a light as clear and strong as possible, that the true state of matters may be easily seen, and referred to by any one on all necessary occasions.

This has never been done, in parliament or out of parliament. The question has constantly been argued as if it were one of theory and principle merely, not of facts and figures. No one, therefore, is convinced one way or the other. Were the legislature to be to-morrow compelled to yield to the pressure from without, and abandon the cause of agricultural protection, it could not, on retreating, point to a single palpable fact; it could only repeat opinions and predictions, which its opponents could, in their turn, overlay with opinions and predictions as plausible, and ten thousand times more numerous and more fiercely urged.

We cannot, in the space here afforded, argue this question at the length it requires; but some agreed principles are absolutely necessary to be stated.

People, and the happiness of people, are the being and well-being of a state, its origin and its end; every pursuit, and every source of profit, should be considered with reference to these two essential points, *and so considered agriculture is invaluable.*

Agriculture is not only the most *useful* art, but also the most indispensable. It is not only a *manufacture also*, and the most profitable of manufactures, but it is the best foundation of all other manufactures.

That it is a manufacture, and a finished one, is certain; for the grain, when ready for the market, admits of very little further process except that of consumption.

It is *profitable—for every grain raised beyond the seed sown is profitable to the state*—adding the whole extent of its produce to its wealth, and the whole of the people employed in that production to its strength. Its profits to the state are also *certain*, so far as required for home consumption; because, so far, there is no risk of an uncertain market or uncertain payments. It employs a great number of hands, it employs them *healthily*, and in cir-

ɔes calculated to leave their morals pure, and their numtle capable of reduction from the use of machinery.

;hese are what render a manufacture really useful to a .ough that may not be the general opinion; because ıust always be paid for, particularly so far as indispensur; and the more, therefore, that are *necessarily* employed l in a state, the greater is its wealth and the greater its —the two great requisites to the existence of a state; ey are employed healthily and happily, the only remainition is fulfilled.

ch for *this* view of the subject.

Britain is not so easily worked as many other countries. r be admitted, and even regretted, but must we, thereıe to cultivate Britain? The holder of a poor farm may he could purchase corn cheaper from a neighbour than ·aise it for himself; but whence could he obtain the purchase? He must draw his subsistence from his own starve, and so *we* must use the spot on which we have ed to the best advantage or starve. However poor our farm may be, we must live by them if we have no other And *the service of others is always uncertain*—it should depended on by a state.

uppose that our position and circumstances point out chief dependance must be on our exertions as artisans, does not absolve us from making the most of our posiher respects. An artisan set down on *the poorest spot* ll be a gainer *by drawing from it what he could in his e or by his spare hands;* and Britain is anything but st spot. From our industry and intelligence as farmers, ries, however naturally rich, can compete with us in the f produce drawn from an acre; and when the season is r favourable, our produce, even in the finest grains, is nd to those of much sunnier climes.

ıing our agriculture restricted, however—and by the ɔf protection it is not doubted it would be restricted— ıust be the resort. It is, therefore, necessary to consiwould be the result of that.

in grass there must always be, under a proper system tion; and these, too, producing to the very utmost. But *ls* mean, to me, *lands habitually lying in grass*, and to *ed.* To ascertain the ultimate gain or loss between ːe and pasture, we must first consider their relative think it is from having neglected to do this accurately ;hat much of the virulence that has been introduced into ;ion has arisen; for, had it been accurately considered,

and the results shewn, I cannot suppose that it would any longer have remained in discussion.

It is said the Duke of Buckingham has stated that the value of cultivation for corn over pasture is as *four to one*; and it is said, farther, that he has made this statement from honestly desiring to be within the mark. But who is convinced by this? No one. It is, perhaps, an honest opinion, perhaps a correct one; but where is the evidence? There is none. Should an opponent reverse the proposition, where is the ground for gainsaying him? At this moment there is none whatever. I will endeavour to supply it.

I must set out by saying that cultivation and pasture hardly admit of comparison. The difference between them leads into so many collateral channels, that it is almost impossible to follow them, and almost all we can say is, the difference is so great that it is scarcely conceivable.

In the vicinity of a city, pasture-land may give even more rent to the landlord than it would give in corn, and more profit to the occupant, for particular purposes. It may be useful in keeping cattle for the butcher, or in yielding milk, butter, or cheese for those who require those luxuries and can afford to pay for them; but does that in the slightest degree indicate the difference between pasture and cultivation *in real results to the state? Not in the slightest degree.*

Take but *one species of result*—the result, namely, in the quantity of human food produced:—

An acre of good land (and good land *only* is likely to yield available pasture) will produce six quarters of wheat; a quarter of wheat yields 120 loaves,* at 4 lbs. to the loaf, 480 lbs. per quarter, and for six quarters, 2,880 lbs.

Now what would the same acre produce in beef? It is true that in this country pasture would be almost *impossible, per se*. But for *winter crops, straw, &c., alone produced by cultivation for corn*, the cattle pastured in the summer must be killed on the approach of winter, as of old, or they would die of hunger. But let us fancy pasture to be *possible, and our year all summer, and what is the result even then?* Suppose an acre of grass to maintain a middle-sized bullock during six months of summer, then an acre sustains all the year round exactly *half a bullock*. But he is not *dropt* a bullock. Even with all our present resources of pasture enriched by agriculture, and winter feeding more

* This is beyond the London estimate, and perhaps any estimate, on one quarter or one sack. This estimate proceeds on eight quarters, yielding ten and a quarter sacks.

ərful than the summer, he requires three years to come to ›ction; and, on pasture merely, though good all the year d, he would require five years. But deduct for his minority, a he necessarily requires less food, (though he then eats to r as well as to be fed,) two years entire, and he is ripe in three s. In this way an acre of pasture, feeding half a bullock *throughout the year*, and producing that only in *three* years, uces exactly *one-sixth of a bullock a-year;* at 36 Scottish es of 16 lbs., 96 lbs. a-year!

›unt meat in actual strength, and in soups, &c. derivable it, of *thrice* the value of bread, (and, according to our best s on this subject, that seems extremely doubtful,) still the ing of pasture is only equal to 288 lbs. of bread, in place of 0, or exactly *one-tenth of the value produced by cultivation.* re may be a trivial produce additional, in young cattle fed on emnants of pasture left by the elder, but this is scarcely to be ılated; and when the effects of pasture have been considered l to those of agricultural feeding and pasture combined, it ıt not to be calculated. It must be *held as established, that ure only produces human food equal to one-tenth of that prod by agriculture.*

ho, then, would talk of abandoning a country like this to ure?—a country with a limited territory, densely peopled, people every year increasing, in a way to render no ordinary ight necessary, with all the advantages of a domestic industry r the management of domestic energy? Even upon *this first* of the matter, the idea could not be justified; for it were, our eyes open, to sacrifice 90 per cent. *in produce.* But it ld be to sacrifice greatly more *in value;* for whereas 96 lbs. eat can be purchased, even at home, for about 48s., six quarof wheat cannot be purchased and imported under from 50s. 5s. each, or, were we considerable purchasers, 60s. or 70s.; holding them at the lowest, they will cost from £15 to £17, *ven times the price of what we could raise in their stead;* and, ıg them at the highest, ten times.

ut even this is not all, nor anything like all. By cultivating orn, *more grass and vegetables of every description*, the food an and of animals, are raised by the interstitial or alternating s *than could be raised were the whole cultivable land in pas-*; and they must constantly continue to be so raised, because are *indispensable accessories of agriculture.* In this way, *great primary articles of corn and straw become absolutely gains!* Nor are they merely gains in themselves; they by the exertions of agriculturists, *every year enriching the* and, by draining, improving the climate; and not only easing the production of animal and vegetable food, and, con-

sequently cheapening the food, but cheapening the production also. What an immensity of human food, therefore, is produced by agriculture that could not be produced without it!—besides hides, and tallow, and wool, and other materials of manufacture! The view thus opened up is hardly capable of being followed. It is *more* than adding two-thirds of the cultivable soil of the country, as it were, to its extent!

French writers, affecting to view our circumstances with a more "learned spirit" than ourselves, deliver themselves as follows:—

The *cancer* of England is to be found in her *territorial* and *manufacturing constitution*. When out of one hundred families there are only *twenty-five* employed in agriculture, it will be easily comprehended that the production of manufactures must be carried to an exaggerated extent to provide sustenance for the other three-fourths of the population. Under the present social organization, the *sine qua non of existence for the English* is for them to continue to be, as they have been, the purveyors of manufactured goods for *the whole world*. The question is, Can they ever again become so? and the answer is more than doubtful. France and Germany are manufacturing states; Russia is endeavouring to become so; the United States desire to protect their manufactures in the north, &c.

The most intelligent among ourselves do not hesitate to proclaim that, in their opinion also, we are in danger "from an immense and daily increasing permanent manufacturing population, *depending for their existence on labour wholly fluctuating and uncertain*."—(*Letter by a Renfrew Heritor.*) These are solemn warnings, and, doubtless, should have their weight; but I think that, as yet at least, that weight is greatly exaggerated: for in estimating the persons depending on agriculture in this country, I would incline to reverse the assumption of our Gallic neighbours, and say that not one-fourth, but *three-fourths* of the people of this country, or upwards of 20,000,000 of persons of *all* ranks, from the landlord to the humblest artisans, and their families and dependants, are, *directly or indirectly, supported by the agriculture of this state in all essentials of subsistence.*

The most cursory reflection will shew this to be the fact, and from one circumstance—that *the manufacturers for the foreign market* are the only persons dependant on external sources; and *they*, as the agriculturists truly say, and as the emoluments derived from that source shew, are, and ever have been, but a *fraction* of this community. No one should undervalue them; on the contrary, so far as they can find profitable employment all their wealth and all their strength are added to the wealth and strength of the country. In times past these were great, and even now they *should be great*, or they are deeply injuring us; for it will be seen that, with their dependants, I hold them equal to millions; but it is equally certain they do not hold the overwhelming rank they claim, nor which is ignorantly assigned to them, as a glance at the value of our exports, and of the food imported in consequence, will convincingly shew.

In the meantime, we have seen the results of ceasing to cultite in the loss of human food. It is 2,592 lbs. of bread per re; or, at least, the loss of five quarters of grain or 2,400 s. On 1000 such acres, the loss, at the lowest estimate, is 400,000 lbs.; at a loaf and a-half a week, *bread* for 400,000 ople; at 6d. per loaf, L.15,000; or, taking it in quarters of eat, 5,000 quarters, at L.2 : 10s. per quarter, L.12,500.

And on 1,000,000 such acres, the loss, after deducting for the oduce of the best pasture, would be L.12,500,000.

This, it would seem, is a very conclusive view.

There is another—the loss of the landlord from ceasing to ltivate, as compared with that of the country; and it is proper consider this in passing, as the question of protection has ten been asserted to be a landlord's question only.

In high and remote districts in Scotland, many acres are in ltivation that do not yield the landlord more than 5s. rent. It true these may not furnish much to manufactures; but they rnish *something* in all directions, for buildings, clothes, and plements, just as the richest do. Their possessors are valuable the state, as well as to manufactures; and but for this home ltivation, they must be maintained from abroad, or themselves abroad. Suppose the cultivation of such acres abandoned, e landlord might still receive 2s. 6d. for pasture, and they uld each pasture two-thirds of a sheep; the gain from which y be to the farmer 4s. 6d., but say to the country 6s.

1000 such acres, therefore, the landlord would lose, at 2s. 6d. per cre, ... L.125 0 0

corn, or other cultivation, they would have produced, at 2½ quarers per acre, (or the value of this,) 2,500 quarters, in medium rain, at only 30s. per quarter, including the straw, L.3,750 0 0

duct proceeds of pasture, as above stated, at 6s. per cre, ... 300 0 0

Loss to the country, 3,450 0 0

Exceeding the loss of the landlord, by L.3,325 0 0

more than pounds for shillings. In other words, the loss to the country, even n poor land, is more than six-and-twenty, it is nearly seven-and-twenty, times reater than the loss to the landlord; and the loss to both is L.3 : 9s. per acre.

'ake, again, rich land, of which the medium rent to the landlord may be L.3, ugh that is high,) and say that in pasture he shall only receive L.2, though it is ged (perhaps in order to soothe him) that his loss would not be so great; but e it at L.1 per acre, then the loss to the landlord on 1000 such acres L.1000 0 0

ultivation these acres would have produced, at say only 4 quarrs per acre, 4,000 quarters, (though 5,000 or 6,000 quarters would e nearer the mark;) this would be of more valuable grain, and *uld not* be imported under L.2 : 10s. per quarter, L.10,000 0 0

s is the produce that must be *got in*; the loss in raw, and in fertilizing the land, &c., cannot be ated.

Carry forward, L.10,000 0 0 L.1000 0 0

Brought forward,	L.10,000 0 0	L.1000 0 0
Deduct as *the possible* proceeds of pasture, as formerly stated, 96 lbs. of beef, at 6d., 48s. per acre, . . .	2,400 0 0	
Distinct loss to the country by ceasing to cultivate these acres, ...		7,600 0 0
Exceeding the loss to the landlord by		L.6,600 0 0

So that, even upon these acres, though naturally richer, and consequently yielding more in a natural state, the loss to the country would be more than six and one-half times greater than that to the landlord, and to both the loss would be £7 : 12s. per acre.

I have, doubtless, understated the produce of these acres in cultivation, and overstated it in pasture; but still the loss exceeds any previous estimate.

It shews also, in a striking manner, that the loss to the country, both absolutely and as compared with that of the landlord, is greatest from ceasing to cultivate *the least valuable land*, (the land that would first cease to be cultivated ;) because that land, being less naturally fertile, pays less both to the landlord and the country in a natural state; and its value is more enhanced, because its produce is more increased, by cultivation.

But both shew that the question of cultivation is not a question with the landlord but with the country; the loss from the abandonment of cultivation ranging from 69s. per acre on poor land to 152s. on the richer, *as the country is concerned*, but only from 2s. 6d. to 20s. as the landlord is; while the loss on any considerable number of acres would be enormous, and all of a nature to have been *sure gain*, and in an article at once invaluable in itself, and as a source of national employment.

To shew the loss to which the country is annually exposed, and has been exposed for centuries, by the old-fashioned notions still prevailing in England, I beg leave to submit the substance of a communication of a Mr Thomas Underwood, Hardington, near Northampton, to the *Herald* newspaper of that place. He says—

> With the consent of the proprietor, two pieces of old turf, (meaning grass-land, of the second class, in the parish in which I reside, were ploughed this spring after proper drainage, and sown with oats in the usual manner, and the produce of the first piece is estimated at 70 bushels (11⅔ quarters) per statute acre; the second piece, only a part of a field, produced 64 bushels (10⅔ quarters) per acre; and I have no doubt of the successful cropping of this land for a series of years in the hands of the present well-managing tenants. A part of the field, containing about 14 acres, remained unploughed, and was not stocked in the spring, but mown for hay in July; and the produce when gathered amounted, in the whole, to about 5 tons and but little herbage has grown since.

The result to the country is, even in this instance, where the turf broken up is only *second class*, that, according to the pric

uid oats, in this poorer country, (Scotland,) namely 9d. for hay, and 21s. 8d. for oats, the acre in grass produces , allowing so........ ... foggage, though it seems hardly to unded, 30s.; while the acre in corn produces £11 : 11s. 2 : 12 : 8. Had the crop been wheat, and of 8 quarters , at 52s., (the lowest average importing price, all charges l,) the produce would have equalled £20 : 16s.! The of these three crops is £15; the loss per acre, after de- the produce in grass, £13 : 10s., on 4,000,000 such acres, 0,000, and so exceeding, by several millions, *the total value* e manufactures *exported!*

such are the losses annually inflicted on the country from cause, proceeding from flagrant error.

manufacturers calculate that the cultivators of even 00 of acres would, at 3 men to each 100 acres, amount to 000 individuals; and that, to give these even £50 a-man, nable them "to swing on a gate all day, and eat fat bacon," is considered by them the *summum bonum* of an agri- labourer,) would only cost the manufacturers £3,000,000, nsequently, that it would be greatly to their advantage to annuity, and be permitted to purchase corn where they But, first, they certainly understate the amount of the ate labourers, or the system in England must be much rfect, or imperfect, than is generally understood; next, get the dependants of those labourers, including manu- s themselves, and these of every description, from the hat hoe; and, lastly, that it is not the loss to *the labourers* to be considered, but to *the country*, and that this could estimated at less than £7 an acre on fair land, or, on 00 of acres, £14,000,000. *This*, then, is what the manu- s ought to pay to the country, and which nearly equals al value of cotton goods exported, including profit and ogether, and is, very likely, *double the amount of profit* . What reckless folly, then, to make such statements, on the faith of them, suggest such sacrifices!

cannot in this place enter into the inquiry whether, ng us to make a sacrifice, even any sacrifice, of our agri- other countries would *meet us*, and receive our manufac- But I think every appearance justifies us in concluding, e French writer whom I have quoted, that, as regards the states we are in the habit of looking to, this seems ely doubtful. Every advance upon our part to that free- trade that seems now to be considered so rational and l, appears only to cause other nations to raise their bar- f exclusion higher. The reason is, they conclude, and that there is no mode of apportioning the people to the

soil of a country, and finding them employment, but *by making them serve each other, and preserving to them their privileges.* They have seen the profit of that policy as exemplified in Britain; and they see that, to let their institutions down, after having so far raised them up, were only to postpone the period of their natural growth and prosperity.

Without insisting that *we* should press unnaturally forward, it is surely proper to consider whether we should willingly *retrograde*, and restrict that agriculture which we have already carried so far. Our conduct in this must be regulated by two considerations; namely, the consideration of the absolute value of our agriculture, and of its relative value.

I think neither of these points has ever been stated in the clear and palpable manner in which they are capable of being stated.

According to some recent statements, it is held that—

About *one-third* of the population of this country is employed in agriculture, and of these fully three-fourths are, directly or indirectly, employed in the raising of corn. The average growth of all sorts of corn in the United Kingdom may be safely estimated at about 64,000,000 quarters, at 35s. per quarter, including all descriptions of grain, L.112,000,000, or nearly four times the annual value of the cotton manufacture; and the total value of the agricultural produce of England and Wales, exclusive of wood, &c., is estimated at L.132,500,000.

Another authority proceeds as follows:—

According to the census of 1831, there are in the United Kingdom 2,478,411 persons employed in agriculture, and 710,531 in manufactures. *Seven-ninths of the population are dependant on agriculture, and two-ninths on manufactures.*

In 1841 the average proceeds of agriculture in England and Wales was about L.300,000,000, and of manufactures L.173,136,306; of which exported, L.47,138,316, and sold in the home market L.126,000,000, of which last at least two-thirds were purchased by the agriculturists.

For every L.1 employed in manufactures, L.15 is employed in the cultivation of the soil.

The average consumption of wheat is about 19,000,000 quarters annually, of which 3,000,000 odds are imported; and every quarter introduced supersedes just as much labour as would be required to produce it at home, &c.

These statements obviously differ exceedingly, and I might adduce others different still, yet they are made upon equal apparent authority; and speakers at public meetings, while admitting the greatness of the gross amount of agricultural produce, yet affect to reduce it to a great extent by *deducting expenses.*

We may rest assured that none of those estimates are correct. Whence could the *data* be derived? And as for deducting expenses, that idea also is totally incorrect. For what are those expenses? Why, *the national business!* the wages that maintain our agriculturists, and which constitute a great part of the value of the whole matter. These expenses, consequently, *must not be deducted.* The way to state the value of agriculture, is to consider *the entire produce, short only of the seed sown;* for "everything

hat rises from the ground beyond the seed sown," *that is the value of agriculture.*

And what is this value? We must avoid resorting to figures; here are no *data* for such estimates, and there hardly can be any; but there is a way to state the value of the proceeds of agriculture that can admit of no doubt, and that way I shall endeavour to follow.

When we reflect for a moment, then, we are compelled to admit this, that, *every year, the subsistence of the world must rise from the land or the waters in some quarter.*

The population of these United Kingdoms is universally assumed at 27,000,000, and, from the precautions recently taken in this matter, it must be near the mark.

The total value of the fisheries is not great. Even according to Mr M'Culloch it is under L.4,000,000 sterling; and as of 329,557 barrels of herrings taken, by the latest returns published, only 11,030, or about a thirtieth part was consumed at home, a like proportion of the L.4,000,000 would not be considerable: it would very little exceed L.130,000; while the grain imported into this country is, on an average of ten years, short of 1,000,000 quarters. The provisions of other descriptions imported, before the tariff, were more trifling still; nor are they very important even now.

From all these it follows that, from the agriculture and the pastures of this country together, but *chiefly the agriculture*, (for all the produce of grass-lands *augmented by agriculture must be considered agricultural,*) *we derive the subsistence nearly of* 27,000,000 *of people.* This is the true way to state the value of the products of agriculture; and thus stated there is no evading it. The imported corn would not subsist us a month even in bread, for that requires 1,500,000 quarters at least, and it is well known we do not live by bread alone.

At what, then, must we estimate this immense mass of produce that, with so little assistance from importation and from fishing, subsists 27,000,000 of individuals? and their cattle for use and pleasure? reproducing also the seed to be sown?—for were that seed not reproduced it also must be purchased—*at what must we estimate this?*

Officer and soldier cost government £30 a-man; and it is well known that many officers add greatly to their pay. Even the farm-labourer costs £29: 3s., as is shewn by an exact and indisputable account published the other day. True, this includes their clothes; but does not the agriculture of this country produce much *flax, leather, tallow, and wool?* Considerable quantities of the produce of leather and wool being even exported, and perhaps of the flax also. But these are all adults? Then

reduce the expense of their subsistence in l, meat, and veg
tables to £20, (less than is required to p y even the dri
of a citizen of the middle rank)—and let this include *noblem
and gentleman, merchant, manufacturer, and professional man,* a
—and still the produce of the agriculture and pastures of th
country, but chiefly, as we have said, of the agriculture, amou
to the enormous sum of £540,000,000 sterling! *exclusive* of t
millions of bushels of barley manufactured into porter, ale, be
and spirits, for export and use; exclusive of the keep of anim
for use and pleasure, and of the seed of various descriptions
26,000,000 of cultivated acres, the last alone equal to at le
£20,000,000 more, and raising the whole produce of agriculture
this country to perhaps £600,000,000!

This, therefore, or nearly this, is the enormous amount
wealth and strength with which we are called upon to ta
per, when we are called upon to make changes in our ag
cultural arrangements. And for what? *Not for our manufactu
or manufacturers*; for by general consent *three-fourths of be
at least, depend upon our agriculture.* This is admitted ev
by manufacturers themselves, and if it were not, it is i
disputable; it is for the benefit of our *exporting manufa
turers and their exports.* And what are these? They a
£47,000,000. An average of six years gives only £45,698,00
But hold it £47,000,000, this is for *manufactures of all descri
tions.* Now we hear of no complaints against a moderate prote
tion to agriculture from any but the manufacturers of *cott*
And what is the amount of *their* exports? In 1842, £20,596,12
Deduct from this *the entire staple of the article, the dyes,* and (
inconsiderable item according to all accounts) *the paste,* ma
from wheaten flour, and between the cotton and other manufa
tures *legitimately* requiring it, causing a consumption perha
equal to what we are obliged to import; and making allowan
for charges abroad, and for bad payments or no payments, t
total value of cotton goods exported, and yielding profit to t
country in the shape of wages of men and machinery, is certain
short of £15,000,000; about 11s. 1d. sterling to every man a
woman in this country, and no more.

Need we contrast with this 11s. 1d. the *total,* or *almost tot*
subsistence of about 27,000,000 of people? I think not.

We are not now permitted to argue as if friends might o
day be enemies, and those accustomed to supply us with fo
might, at any time, close their ports against us; though that h
very lately happened without any ground, and it is obvious
might happen, at any time, upon the plainest principles of exp
diency, and, it would be said, necessity; but it is, in the l
degree, necessary that we should consider how much a very p

tial dependance upon others for an article so indispensable as food might place us at the mercy of those others *as to price*, causing us lose more in one year as importers of corn than we could gain as the exporters of manufactures in ten; and agriculture cannot be taken up and laid down at pleasure—it might, indeed, be easily laid down, but not resumed in years.

From every view, therefore, the idea of restricting, or not encouraging agriculture, seems to be equal to this—Whether for uncertain profits or presumed profits, to a certain extent, *we shall go back to certain poverty?* On every £1,000,000 worth of goods exported we *may*, by great exertion and good fortune, gain 10 per cent. for labour, or £100,000. But by every 500,000 quarters of corn unnecessarily imported, (and this renders the adventures of about equal value,) we, at five quarters to the acre, throw 100,000 acres of land into pasture instead of corn, and sacrifice from £350,000 to £700,000.

This explains distinctly many very striking, yet hitherto unexplained, political phenomena. One may be sufficient both in explanation and warning. While *Rome* continued to cultivate *her own territories*, she continued great and powerful; and the moment she ceased to cultivate, and received corn from her conquered provinces, she declined. The reason was this—abandoning the wealth that supported her people she abandoned her people, or she made them idle dependants upon others. The possessor of 10,000 Latian acres might, at a few shillings an acre, have a sufficient income *for himself and his herdsmen;* but this was not equal to *the state to the subsistence of* 10,000 *active citizens*, *so the cheap corn of* Egypt *proved the ruin of* Rome. On the very same principle, the cheap corn of the Ukraine, *were it our own province*, would tend to undermine *Britain*, and I hope the principle is understood; wealth and numbers will always be, where there is most steady labour in valuable matters. Should we be less certainly undermined by taking corn from states that are *not ours?* by taking from Poland and Hungary that which supports the millions of our own people dependant on agriculture? and enriching their people instead of our own? No; and for this clear reason, that the *profits* of commerce bear no proportion, in amount or certainty, to the *loss* from abandoning agriculture.

Were we permitted to speak metaphorically, I should say, every peopled country is more or less like a country protected by dykes. Where the people are few and the space large, the partial sweep of an inundation is not felt; but where there is no ground to which to retreat, the protecting walls must be narrowly watched, as the slightest disturbance is fatal. And, of all countries, Britain should be vigilant in this respect, for *her slightest movement is material.*

From all the facts we can bring to bear upon this matter, it would seem that any material changes in regard to our agriculture would be the most wanton tampering with an established and prosperous policy, and with the people employed in it and their dependants, as well as with those depending on their labour for bread, that can well be conceived. The danger, indeed, appears, for the present, to be past; but there is still a ground-swell requiring to be watched as strictly as the tempest past. We cannot better prepare ourselves for a recurrence of the storm than by carefully surveying our ground; and I trust the foregoing observations tend materially to our instruction. I have shewn, I think distinctly, that agriculture is *ten times more profitable than pasture* even in direct results, and that its indirect profits, in increasing the fertility of the soil, and augmenting all its products, *cannot be calculated.* Instead of encouraging pasture under any pretext, it should be understood and remembered universally that every acre unnecessarily in pasture is a direct loss to the state in its collective capacity, by all the value of corn and other esculents not produced, and of meat that would naturally arise from our green crops, compared with which the meat produced by even the finest pasture is perfectly trivial. The very *offals of cultivation* for corn, (which, among other things, include green crops,) are more powerful in producing meat than the finest pastures—leaving, at the same time, the soil of those pastures for the production of corn. In short, the restriction of agriculture is synonymous with the restriction of the state; its increase, in all feasible circumstances, synonymous with the increase of the state.

It is easy to see (says Professor Liebig) how close the connexion is between agriculture and the multiplication of the human species. Cultivation has no other object than the production of a maximum of valuable substances in the smallest possible space.

And the labour employed in producing them is the strength of the state.

Whatever the farmer *may do*, therefore, I think it ought not to be difficult for him to assert both the importance of his labours and the necessity for deeply considering whatever may tend to endanger them. AGRICULTURE *is the great interest*, the real and substantial dependance of the state. There are other interests of great value—the export interest for one; but we see that agriculture is the great original source both of work and of wealth; that most of the other pursuits of the state are mere ministrants to agriculture and those employed in it, and to those depending upon them and their dependants; that over the world this is, and must be, true;. and that to lose our hold of agriculture is to lose certainty for hope.

It is not the importation of a few millions of quarters of corn

have to *fear*, but *the loss and danger* arising from such tions, as a habit, that we should *avoid;* for little less of a ry commodity in the market than is required exceedingly ates the price of that commodity, and little more in the than is required as much depresses it. We cannot with- equal price from the farmer, without hazarding the whole ucture at the foundation of which he stands;* and this, as said, is a consideration, not for him or his interest, but whole community.

ese points are established, (and I think they are,) this n on the time of the Farmer and the public will not have vain. Let it always be remembered these are no longer *guments* and statements of *opinion*, they are statements and figures, clear and unembarrassed as statements can that there is *nothing* of this description opposed to them. ss of manufactures is indeed great; but *for what?* and *d?*—for the use of the *country*, and *paid for by its pro-* The only possible source of *national profit* in manufactures *xported manufactures*, and we have seen that the total of these is not great, comparatively; and, so far as they on *imported materials*, the sole source of profit is in the lized *for work:* we *must* deduct the staple and all expenses. oduce of agriculture is *all work*, consequently *all profit*, whole community is concerned,) excepting, as I have excepted, "the seed sown." This it is that constitutes its profit, and the extreme peril of deserting or limiting it; may trust that neither will happen.

ARKS ON THE PRESENT STATE AND PROSPECTS OF AGRICULTURE IN NORMANDY.

By Mr T. W. LORIMER, Aberdalgie, Perthshire.

TING from Havre last summer, I went through the depart- the Lower Seine (the only one of the departments of idy situated on the north of that river) to Rouen. Hav- nerly seen the beautiful banks of the Seine, I took a route the interior by Goderville, Bolbec, and Yvetot. The Seine (or Upper Normandy) is one of the chief grain- departments in France; and the part of it I passed , called the Pays de Caux, is the richest grain district in e produce of wheat per acre over the whole of the Lower s, however, inferior to that afforded by several other

departments.* The [illegible] department is more of a pastoral [illegible] cream cheese of Neufchatel. It is [illegible] to [illegible] tural fertility of the soil, [illegible]

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* The following particulars as to the production and consumption of wheat [illegible] quoted in the Normandy Agricultural Journal from a recent French publication by MM. Moreau de Jonnes et Loiseleur-Deslongchamps, and are here converted into English measures and money, and compared with similar statistics as to [illegible] and other countries.

Annual production of wheat in France about 24,000,000 imperial quarters, which, at 42s. 5d. per imperial quarter, the average market price, gives a value of L.52,100,000. In France the cultivation of wheat, without including the [illegible] fallow, occupies about 13,500,000 of acres, being more than a tenth of its whole [illegible]. In 1829 the extent of wheat for each person in France was .42 of an acre; in Great Britain and Ireland it is reckoned at .32 acre; in Prussia at .[illegible] acre; in Sweden at .083 acre; in Poland .054 acre; and in Spain .49 acre.

The quantity of seed-wheat for France does not amount to less than [illegible] imperial quarters, which, at 38s. 5d. the price of production, is a sum of L.7,[illegible]. Thus the productiveness of wheat, determined by the comparison of the quantity of wheat sown with that reaped, is a little more than six for one.

The following table will give an idea of the unequal distribution of the produce of wheat in different departments :—

Maximum.	Imp. Qrs.	*Minimum.*	Imp. Qrs.
Nord,	794,500	Loire,	[illegible]
Seine Inferieure,	731,240	Haute Loire,	[illegible]
Eure,	562,540	Lozere,	[illegible]
Aisne,	562,200	Cantal,	[illegible]
Pas de Calais,	539,820	Creuse,	[illegible]

The following is the produce of wheat per acre, in imperial quarters, of the ten departments of greatest and of the ten of least fertility :—

Greatest Fertility.		*Least Fertility.*	
Nord,	2.94	Gard,	1.[illegible]
Seine et Oise,	2.66	Landes,	1.[illegible]
Oise,	2.66	Vaucluse,	1.[illegible]
Somme,	2.52	Creuse,	1.[illegible]
Seine et Marne,	2.52	Basses Alpes,	1.[illegible]
Bas Rhin,	2.52	Lozere,	1.[illegible]
Aisne,	2.38	Cantal,	0.[illegible]
Cotes du Nord,	2.38	Loire,	0.[illegible]
Seine Inferieure,	2.34	Dordogne,	0.[illegible]
Pas de Calais,	2.24	Lot,	0.[illegible]

From the statements given above, it appears that the average produce per acre for France is 1.77 quarters, while, from statements on the same authority, that for Spain is 1.02 quarters; for Prussia 2.4 quarters; and for Great Britain 2.5 quarters. According to the supplement to the *Encyclopedia Britannica*, (Arts. England, Ireland, and Scotland,) the average produce per acre for England is about 2.5 quarters; Ireland 2.5 quarters; and Scotland 3.8 quarters. Sir Charles Lemon estimates it at 2.65 quarters for England; Mr Dudgeon about 3.5 quarters for Scotland; and Mr M'Culloch 3.25 quarters for the whole island; while Professor Johnston, comparing these several statements together, supposes the average for Great Britain to be about 3 quarters of wheat per acre.

If these statements approximate at all to the truth, (and the estimate for France seems to be recognised by the French themselves as just, while the nearness to agreement among those for Great Britain is a proof of their accuracy,) they certainly place the superiority of British, and more especially of Scotch, agriculture in a very striking point of view, while they also afford a proof that, within certain limits, cultivation has more effect than climate on the production of wheat.

a laborious and expensive than to a good system of cultivation, at the superiority of the grain crops (especially of wheat) raised the Pays de Caux is to be attributed. The soil is throughout reddish-yellow clay mixed with pebbles of flint, and containing great quantity of lime. It seems easily reduced to a fine ould, and, probably from being kept open by the pieces of flint, little subject to wet.

Bare-fallowing is still very frequent in the Pays de Caux, and e fallows seem to be carefully worked and well manured.

The clover fields present a sad mixture of red clover and docks, th many other sorts of weeds, occasionally some of the sown asses,* and numerous stalks of oats from the seed lost in the aping of the preceding year's oat crop with which the clover always sown. *Sainfoin* is grown to a considerable extent, d also *Trefle incarnat*, said to be excellent for milk cows, but ither appear to yield such heavy crops as the common red over.

The clover crop is partly made into hay, and partly depastured horses, cattle, and sheep. From the want of enclosures in ost districts, none of these are allowed to go at large. The eep are herded crowded together on a small spot, and the rses and cattle (mostly cows) are tethered, or "*au piquet*," a line along the outside of the uneaten clover. This is the actice throughout Normandy and the Channel islands, except the large prairies where oxen are fed. With stallions the stem of keeping them separate is necessary to prevent them om fighting.

Rents in the Pays de Caux are lower than in most parts of rmandy. They range from 15s. to 25s. per acre for ordinary id. In the vicinity of Rouen, from L.3 to L.5 per acre is paid, ile the rich pasture of the Vallée d'Auge is rented still higher. The farms, which in this district are often of considerable

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The foregoing statements are, however, somewhat at variance with the impression ad formed from observation, as the wheat crops in many parts of the Continent, l especially most of those I lately saw in Normandy, appeared to me to be heavier l more regular than what are usually to be seen in the best districts of Scotland. a there be any deficiency in France from imperfect reaping or thrashing, which er operation is, with very rare exceptions, still performed by the flail?

* The cultivation of the artificial grasses, though much less attended to than in tland, is not, however, entirely neglected in Normandy. At Rouen, I was furhed by M. Grainville, seed-merchant, with a list of the grasses and forage plants st in use. In this I find the names of all those most esteemed in this country, h the exception of the *Timothy* grass, *Rough cocksfoot*, *Crested dogstail*, and most the poas or meadow grasses, while it contains the names of several with which I not previously acquainted, such as the *Trefle incarnat*, (much used,) *Trefle de tagne*, *Trefle du Mons*, *Lucerne de Provence*, *Aira capitata*, *Flouve odorante*, *nque laineuse*, *Jacée des prés*, &c.

extent, are mostly held on lease for nine years, and which t
is pretty general throughout Normandy.

To give a fuller idea of the ordinary tenure of farms, a
the way in which land at present sells in France, I shal
some particulars of a small estate advertised for sale, which
furnished me by the agent at Havre. The property is p
situated in a small valley near Bolbec. It is divided into
farms. One farm consists of about 85 acres, let along wit
half ruinous chateau for L.92 ; another, of 12½ acres, f
L.19 : 16 : 8, and the third, of 82½ acres, for L.96. The first
is let on lease. Besides their money rents, the two chief fa
perform some trifling carriages, with small contributions of
ducks, cider, &c. These can scarcely amount to so much a
public burdens, so that the gross free land rental must be
L.200. The value put upon this is L.10,380. Besides th
wood is valued at L.2,500, making in all L.12,880.

Thus the price asked for the property is fully fifty years
chase of the present land rental, besides the value put up
woods. The rents paid are certainly very far short of wha
fine land would bring in Scotland, but, so far as I could
they are much about the general rate in the neighbourhoo
these be very improvable farms, however, and if a view be
speedy amelioration in agriculture, with competition a
farmers and consequent rise of rents, then the price ask
this property will not appear so extraordinary, more esp
when we consider the small return at present obtained
money invested in land in France generally. On this sub
have been repeatedly told that about 2½ per cent. is the or
return, and, consequently, that forty years' rent is the or
purchase-money of land in France. This contrasts so st
with the statement in the "Supplement to the Encycl
Britannica," (Art. France,) published little more than
years ago, that land then sold for only twenty-five yea
chase, that I am at a loss to account for the great change
chief cause given by the French themselves for the wide
ence in this respect between France and England is the
of a sufficient manufacturing and commercial field fo
money, obliging them to invest it in land at however
return. This may partly account for the present d
between France and England, but not for the still
between France of 1820 and France of 1844. Perh
change in France may partly be accounted for by the
Revolution being in 1830 still recent, and the short
policy of Louis XVIII.'s government rendering very p
another revolution, bringing with it new laws affecting p
he as now even the most restless party in France can

ward to any such radical change in the constitution of the ntry as to again alter the law of succession to landed proty, or even greatly to affect its value. The present law of eritance, producing extreme subdivision of property, is thought to keep up its selling price. Shares of properties are stantly falling from the hands of parties unable to live on m, and are consequently exposed to sale. This circumstance, by reasing the supply, seems, at first sight, more likely to lower price; but then the portions exposed are usually so small as be open to competition even among the peasantry, who are ch more wealthy than the corresponding class in this country, l are often eager to become proprietors; and just as a larger ce is obtained for a field of corn the smaller the lots it is ided into, so it may be with land. In this country, on the trary, estates are usually large, and hence the competition for m when offered for sale is very limited. A stronger reason, vever, for land-rents with us affording a much larger per tage on their purchase-money than in France, seems to be t rents in this country are generally higher than the tenants well able to pay even in the present state of the grain rket, while the constant agitation for the repeal of the cornrs gives strong grounds of apprehension to the purchaser of d that its rent must soon be reduced. This question, howr, is so involved in the government, commerce, agriculture, l whole social condition of the respective countries, that I will attempt further to evolve it.

I have alluded to the wealth of the peasantry. Indications of s are constantly attracting the attention of even the passing veller in Normandy; and also in Brittany, though a much orer country, and neither by any means contains a people en to display. Such are the finely-carved antique pieces of niture, heavy old silver spoons, and valuable crockery-ware, to seen in their houses—the lofty head-dresses worn by the nales, ornamented with the finest lace, and often, I have rd, of greater value than a complete ball-dress for a lady—sides instances of peasants advancing large sums of money to cure situations for their relatives, and many other such proofs I doubt not, would multiply on the inquirer the more minutely should investigate the subject. The absence of extreme verty and wretchedness in France is even more striking to an glishman than the frequent instances of positive wealth. Even large manufacturing towns, such as Rouen, one scarcely ever s such revolting specimens of human destitution and misery abound even in our villages.

The greatest disadvantages under which the Pays de Caux peared to me to lie were the scarcity of water and the mono-

tonous uninteresting appearance of the country—perhaps, I may also add, of the people, as they, especially the females, have broad flat Sclavonic-like features, with very little of the liveliness in look or in manner which characterizes the French generally.

The flint, so abundant in most parts of Normandy, makes admirable road metal, for which purpose it is mined by government. The public roads throughout Normandy are generally as well kept as in this country, and some of the *Routes Royales* surpass the best of our turnpikes both in their breadth and state of repair.

The Cauchois plough is a most unwieldy implement, somewhat similar to that used in Kent. Its sole and mould-board, and consequently, the furrow which it makes, are fully twice as broad as those of a Scotch plough; and as it goes little more than half the depth, it ought to turn over much more surface in a given time than the smaller instrument, especially when drawn, as the former usually is, by three splendid entire horses yoked abreast. But there are many serious obstacles to great expedition—such are the two large wheels in front of the plough, above which towers to a height of five or six feet, a heavy and complicated construction of poles and swing-trees, for no other use than guiding the reins—then the enormous collars, surmounted by sheepskin, and the other cumbersome harness with which the horses are burdened even during the heat of summer—and, chief impediment of all, the great admiration of the driver for his team of horses, which prevents him from exacting half the work they could perform.

These and the horses used in heavy waggons for the conveyance of merchant goods are the most powerful in Normandy, nearly equalling the London dray horses. Many of them cost from L.50 to L.60 a-head, while very superior animals, which alone are used for breeding, are, of course, much more valuable. The diligence horses, though very similar in form, are smaller, seldom much exceeding fifteen hands high, and I have heard some of the best of them valued at from L.30 to L.40. The stud of a farmer, waggoner, or usually even of a diligence company, consists exclusively either of entire horses or of mares.

The merchant waggons are sometimes four and sometimes two wheeled. The former I have seen loaded to a height of nearly twenty feet by fully that length, and drawn by nine powerful horses. The two-wheeled waggons often carry such loads as to require four or five horses, and it seems astonishing that such an enormous load does not crush the wheel-horse, especially in descending a hill. To obviate this a contrivance is used which throws back the weight of the load, while the other horses are attached in a line behind the waggon, and, pulling backwards, act

as a drag. Very great care must be taken in packing to balance the weight properly, and when this has not been accomplished, I have seen a heavy stone hung from one of the shafts.

These waggons have been entirely superseded in the traffic between Paris and Rouen by the railroad, and, no doubt, they will soon be so also between Rouen and Havre, by its extension to the latter town.

The unlimited weight of loads carried on these waggons, and more especially the extensive use of those with two wheels, are subjects of complaint from their reputed destructive effect on the roads. The number of horses used in two-wheeled carts or waggons, and, consequently, the weight of the load were formerly limited by the legislature. Latterly weighing-machines have been used; and also it has been proposed to prohibit the use of more than two horses in two-wheeled and of more than six in four-wheeled waggons, with a statutary breadth of wheel proportioned to the number of horses, and in four-wheeled waggons to have the foremost axle-tree shorter than that behind, so that the two sets of wheels should not run in the same ruts.

Most of the two-wheeled waggons are made with the body of an inclined plane, partly shod with iron, for sliding down the goods. This inclined body, being of considerable length, throws the shafts or the line of draught very high. These waggons or carts have in front a wooden roller, movable at either side by long cross sticks put through it; round this roller the ropes which pass over the goods are wound, and can be tightened at pleasure by the use of the cross sticks.

The propriety of relieving, partly or wholly, the conveyance of agricultural produce, from the duty charged upon that of goods generally, is a question which has lately been occupying the French legislature as well as agriculturists themselves.

At Rouen I was kindly shewn the Agricultural Society's Museum by M. Girardin, Professor of Agricultural Chemistry. Many of the implements had been lent out to be experimented with by eminent agriculturists. On the subject of stock I learned from this gentleman that an excellent cross had been obtained between the Merino sheep and those of the Pays de Caux, preserving the fineness of wool of the former with the size of the latter, and having finer symmetry than either.

From Rouen I went through the departments of Eure and Calvados, passing by Lisieux to Caen. Soon after leaving Rouen, this road traverses a pretty extensive royal forest, cut for fuel. The soil for a long way is poor and sandy. The department of Eure is, on the whole, perhaps the least fertile in Normandy. It excels, however, in the number of sheep which is kept in it. I do not speak of them as being fed; for in Normandy

generally a great proportion of the sheep belong to the peasantry, and have miserable feeding. They are herded with their feet tied together in small flocks at the road sides, where, in dry weather, they seem to have little else than dust to eat, and yet always appear to be eating most ravenously. Their long legs and necks, large hanging ears, ill-shaped heads, thin wool and prominent bones, render these sheep among the most disagreeable spectacles that a traveller meets with in Normandy. The above description, with the exception of the last feature, applies also to the better fed sheep of the farmers, for they appear to be all of the same breed. Even by the best farmers they are never regularly well fed from first to last, but merely get good clover during summer, to give them some flesh before being killed, or some strength to endure a winter's starvation.

Mutton, though of such breeding and feeding, is still much eaten, and bears a high price in Normandy. I was indeed astonished to hear of the high prices of butcher meat generally in France at present—beef selling from 5d. to 6d. and mutton from 6d. to 7d. per English pound, in Paris, and very little cheaper in the provincial markets.

The pigs of Normandy are of the greyhound-looking race so common over the whole Continent.

Flocks of geese are often to be seen on the road sides, alternating with those of sheep, while hens and other kinds of poultry are also very abundant, and waggon-loads of them are frequently to be seen on their way to the markets of Rouen and Paris.

On approaching the department of Calvados, the light soil is exchanged for a stiff clay ploughed into high narrow ridges, and bearing heavy crops, of which bearded wheat is one of the chief.

After quitting Lisieux, the road seems to be entering an extensive forest, which, however, turns out to be a rich and thickly-peopled tract of country. Cottage after cottage appears, surrounded by its little orchard, with rich grass or heavy wheat crops below the apple trees. At last an open prairie of rich pasture, several miles in diameter, intersected by water-runs, shews itself like a clearance in the forest. This is part of the Vallée d'Auge, where immense herds of cattle are fed for the Parisian market.

Stall-feeding of cattle is little practised in Normandy. Leading men in agriculture, however, have not failed to remark and point out the advantages of the system. M. de Baumont, in a *Memoir* read before the Agricultural Society of Bayeux, points out well the evils of this indifference to stall-feeding, bearing both on the breeder, from his cattle rather losing than gaining weight during the winter when there is no grass, and on the consumer from the rise of price consequent on the insufficient supply of fat cattle. He

then gives the following short but comprehensive and (unless feeding in open straw-yards be preferred) correct directions for feeding cattle :—

1st, Avoid, as far as possible, tying up beasts to feed unless they be full grown, their health excellent, and constitution vigorous. Those animals will necessarily take on the fat rapidly which neither require to repair their strength nor to support their feebleness.

2d, The byre where they are put ought to be healthy, dry, and clean, the litter good and abundant. They ought to be daily rubbed over with the currycomb and a handful of straw. They should be kept in perfect quietness, and the byre kept at a mild temperature with very little light, so as to induce sleep, to keep them free from all distraction, and to bring out a slight perspiration.

3d, Variety of food, which should be in a good state and of good quality, more watery and voluminous at the beginning of the regime, and then more succulent, divided into smaller pieces, and less voluminous, and of a temperature more nearly approaching to that of the animal, according as the completion of its feeding approaches. Avoid ill-harvested natural meadow hay. Give in all cases a preference to pure sainfoin.

4th, Lastly, excite the appetite by salt and a decoction of roots; make use of mealy drinks slightly heated. Bleed whenever necessary; and, if there be occasion, give laxatives.

The cattle fed in Vallée d'Ange are generally four or five years old, most of them being bred in the Cotentin, (Departement de la Manche,) and worked till that age in different districts.

Those called the Cotentin breed are there said to be identical with that called in this country the Alderney or Guernsey breed of cattle; and the Normans insist that they originated in the Cotentin and not in the Channel islands. The identity of the breeds did not appear to me quite so perfect as it is represented. The Cotentin cattle have, indeed, much of the clumsiness of form and prominence of bone to be noticed in the Guernsey breed, which, with other points of similarity, may go to prove them of the same origin. In those, however, which were pointed out to me as pure Cotentin cattle, I noticed these differences from the Guernseys:—They were generally larger animals, and stronger in the bone; neither quite so high in the hook bones, nor so narrow between them; thicker in the neck, and with a larger brisket; less uniformity in colour; the normal colour dark brown and white, in place of the universal yellowish colour of the Guernseys. But a more important difference than any of these is, that the Cotentin cows are celebrated for the immense quantity of their milk, whereas that of the others is only famous for its richness. I have been often told that it was nothing very uncommon for a Cotentin cow to give from 30 to 40 litres, or from 7 to 9 English gallons, of milk per day; and that from 5 to 7 English gallons, or from 13 to 18 Scotch pints, was about the average quantity per day given by good cows in full milk.

The alteration of the breed of cattle, either by forming a cross between the Cotentin breed and the English short-horns, or by the entire adoption of the latter, is an object desired by most of

in that journal, he thus cautions the promoters of ...
ing:—

Take care, say we Normans, that the crosses which you wi... ing out special encouragement to them, do not produce on o... the same vexatious degeneration which the crosses so extolled ... extravagant degree of thorough-bred English horses, have ... breed of horses. . . . The simple question then is, whether ... Norman breed to obtain an unknown result, or to ameliorate ... myself (he continues) I answer no; we must not introduce ... own till it be proved by figures, and not by words, that we wi... I ask whether the merchants who come to buy our cows, to t... of the Chapel St Denis look to anything but milk? What, i... the harmony of forms? Do the milk consumers of Paris a... cows be well or ill made? No; and why should they, whe... get plenty of milk? . . I repeat then—each place, each provin... dustry, which ought to be encouraged, each in its order; h... for the butcher—there the production of butter—elsewhere o... other district, fitness for agricultural labour.

In a note, the editor says—

It ought to be remarked here that the cattle of the Chann... prizes assigned them at the great competitions in England, a... this remark, because the breed of Jersey and Guernsey is pr... tin breed, which, in France, it is wished to modify by cross... while, in England, prizes are offered for it as one of the impr...

Another writer, speaking of the commissio... the government for procuring an improved ... says—

The ministerial delegates ought to have begun by consulti... ferent qualities sought after by the breeders of cattle, and the... them in this order:—1. Abundance of milk to nourish his fam... activity to assist him in the culture of his fields; 3. The furni... of flesh for his nourishment.

Champagne, for they were in extasies. They bought whatever was offered them for sale, paying more guineas than they were worth pistoles, without informing themselves if the cows were good milkers, or if the oxen were good workers. This artificial breed of cattle (continues the same writer) is the creation of an industry which has produced an article suited to lordly sensuality. These, which might be called pig-cattle, have, for a distinctive mark, the quality of carrying fat between the skin and the flesh—fat which never takes a solid consistence, and is an object of disgust to most Frenchmen. The English, on the contrary, who, though in the temperate region, share the appetites of the people of the torrid and of the frozen zones for fat and oily substances, are charmed with that singularity, and with the quality which enables them to send their beasts to the butcher when three or four years old. In these pig-cattle the bony part can never be too much reduced; while in cattle from which agricultural labour is exacted, the frame-work of bones can never be too strongly organized.

He then goes on to prove by figures how much more profitable the Cotentin cattle are than those of Durham would be, and thus concludes his reflections on the government commissioners:—

These commissioners of the ministry, after having brought their purchase from England, thought proper to make an excursion into the Cotentin. Here they experienced no small surprise; but, in place of admitting their error, all they did was to establish a competition among fat four-years-old cattle. An animal like the pig, which is fit for nothing but being eaten, ought to be sent to the butcher as soon as it is in a fit state. Not so with the Norman cattle, which enrich their master by their work and their milk. Hence it happened that no inhabitant of the Cotentin thought fit to enter the competition with the Durham cattle.

Other extracts might be given to the same effect, many of them, like the foregoing, in that uncourteous, and even coarse bullying spirit, in which the French at present so much indulge towards the English. All of them, however, shew that the superiority of the Durham breed for feeding is not denied, but it is argued that the production of milk and butter, and the fitness for labour, are much more profitable qualities in that district, and that in these the Cotentin cattle far excel the Durham.

The most extensive dairy farms are near Isigny. I visited that of M. Le Chertier at If, in that neighbourhood. In these dairies the milk is not kept, as with us, in broad shallow vessels, to expose as much surface as possible for the formation of cream, but in deep jars of earthen-ware, which material is supposed to be useful for that purpose. Barrel churns, with no other machinery than three narrow bars fixed along the interior, such as were used in Scotland last century, are still the ordinary implements in Normandy. Some of these, with a handle at each end, workable by two women, are fitted for making fully 100 ℔ of butter. The cows are milked into large bright-burnished copper vases, having a handle at the top. The milk-maid, in carrying this vessel, holds and balances it by the handle with one hand, while she supports it on the opposite shoulder. Many females in this rather elegant attitude are to be seen moving along the roads, but the copper vessel is usually the brighest object in the picture,

as female beauty is rather a rarity in Normandy. No cheese is made in this district, and, indeed, the only cheese to be got is Swiss, Roquefort, or some other kind foreign to the province.

The peasantry drink no milk, their almost universal beverage being draught cider, of which they drink enormous quantities. I thought it most execrable stuff, as inferior to that of Devonshire or Hereford as the stale, almost putrid, cistern-water drunk in the Pays de Caux is to pure spring-water. When in stone bottles, however, (in which way it is only to be got in inns of the better class,) their cider is very good. It is drawn off from the bottle by a long syphon or pipe turned downwards at the upper end, where there is a small cock, by turning which, one can fill a tumbler with the frothy liquid in three seconds.*

The plain of Caen is one of the richest and best cultivated districts in Normandy. The ploughs, though smaller than those of the Pays de Caux, have the impediment of wooden mould-boards, while those of the others are of iron; but, in spite of this, they are generally worked with two horses. Some of the bearded varieties of wheat are very much grown there as well as in other districts. It is also one of the chief places for the cultivation of colza or cole-seed, but which is also very general over the whole of Normandy and the north of France. Much money is said to have been made of this crop of late years. Besides affording from its seeds oil and cake, (the latter used there, as with us, for feeding cattle,) the plant, after being thrashed, which is done with flails on the field, makes an excellent manure.

The proper cultivation of this plant is a point which occupies much attention in Normandy at present. On the subject of drilling and cleaning crops, generally, the *Normandie Agricole* before referred to, says—

> In Normandy, where intelligence and the spirit of calculation are far from being deficient, where the art of cultivation has, in other respects, made so great progress of late years, the numerous advantages of drilling have not been sufficiently appreciated. If we except potatoes, of which the cultivation is general over the country, some acres of carrots for feeding horses, and an always increasing quantity of beet-root—a most valuable plant for cattle and sheep—the sowing in drills and beds have been confined to gardens.

The great advantage of drilling in the particular case of colza is then pointed out. The width recommended between the drills is about twenty inches, and between the plants eight or ten inches. The results of comparative experiments with the drilling and broad-cast system are then given, shewing in one case a produce of about a-third more in favour of the former, with a saving of nearly one-half in the outlay. Even potatoes, however, are

* The same instrument is used in the Cafés of Paris for drawing off Eau de Seltz from stone bottles.

ner crops, referred to in the foregoing quotation as being drilled, s generally very imperfectly cleaned, drilling seeming to be nted rather as an end than a mean.

Of late great alarm has been felt among the growers of colza account of the extensive and increasing importation of other nds of oil-producing seeds from the Brazils, Senegal, and Egypt, d also from their own colony of Algiers. The chief of these eds are the sesame and arachide, which have already been ported in such quantities as considerably to reduce the price of e home-grown article. Petitions have consequently been ldressed to the Chamber of Deputies, praying for the imposi-on of such a duty on these foreign productions as will protect e cultivation of colza.

Another great subject of alarm to those engaged in the pro-iction of oil is the extensive substitution for it, in burning, of e so-called liquid hydrogen, consisting of a mixture of about ur-fifths of alcohol with one-fifth of the essence of teberenthine. he use of this newly-discovered compound is described as being ry extensive in the southern departments of France.

The competition (says the *Normandie Agricole*) which will arise between this new stem of lighting and that from the oil of colza, against which the oils of arachide d of sesame are already fighting, not only in burning for light, but also in the unufacture of cloths and soaps, ought seriously to arrest the attention of the coun-es where the culture of grains for oil is one of the most important branches of ricultural industry. It is almost certain that, sooner or later, this branch of lustry will cease to afford the advantageous results which it has afforded till now; d intelligent cultivators ought to be looking forward already to the time when the ltivation of colza will have so far lost its advantages that they will be forced to ink of giving another direction to their agricultural energies.

At Caen I waited on M. Lair and M. Seminel. The former is quite a patriarchal appearance, but seems in his old age to eserve entire the amiability and intelligence which have ren-ered him so beloved and useful a member of the community. e is looked up to as the father and promoter of many of the ost useful institutions in Normandy. He spoke much of the ant of capital and education among the farmers as being the eatest obstacle to the improvement of agriculture in Normandy. [. Seminel, the intelligent editor of the *Normandie Agricole* so ten quoted, seemed to think that that journal and the many gricultural societies at work throughout the country were inging about a visible improvement in the agriculture—that ked fallows were much on the decrease—drilling of crops creasing, and better rotations followed;—and he said that even aining had been tried!

Rye is grown throughout Normandy, but generally in very aall quantities, chiefly, I have been told, for its straw, used in nding other kinds of grain.

Buck-wheat is grown to a considerable extent, but is much less used for bread than in Brittany, where, baked into large thin bannocks, slightly fired, it forms the chief food of the peasantry.

Of all topics connected with agriculture, that which seems to excite the most general interest in Normandy at present is the breeding of horses. This question presents itself in several different and somewhat contradictory points of view. On the one hand there is universal admiration for the strong hardy native breed or breeds, (draught and saddle horses,) and the fear that such may be lost by the introduction of English blood. On the other hand, there is a demand by the wealthy and fashionable for a more showy and active breed of horses, or, in other words, for English blood. These two opposite tendencies are modified by the general desire of avoiding all dependance on foreign markets, which leads to the wish that the present race should be so altered as to supply the demand for showy horses, and this seems to be felt even by those who admire the qualities of the existing race; and, lastly, we have a circumstance influencing considerably all the others—viz., the general encouragement given to horse racing. Before remarking on these, however, I must make a few observations on one class of the horses themselves.

Of the Norman waggon and diligence horses I have already expressed my admiration; but I think the old Norman roadster not less worthy of praise. This is a strong short-backed, square-built, rather stiff-looking little horse, usually from fourteen to fifteen hands high. He is much lighter than the diligence horse, but has sufficient bone and bottom to carry a man with his clumsy high brass pommelled saddle, and all his necessaries, for long journeys of thirty or forty miles, during many successive days. He never varies his pace, which is usually about the same rate as that called with us an amble, being from five to seven miles per hour. It, however, differs in several points from ambling, which is, I think, pretty nearly identical with that slovenly pace called in Scotland, when practised by an inferior breed of horses, "the butter-and-egg trot!" In this the horse raises his feet but little above the ground, so that it is an unsafe pace; and he has no motion with the head, and moves along with perfect smoothness, in order, I suppose, not to break the eggs he is carrying to market. In the Norman pace, on the contrary, the horse lifts high, and makes fully as much of a nodding motion with the head as in walking. The horse I speak of certainly cannot be called well-bred; yet he has such a head and neck as would seem to shew that he is not entirely destitute of breeding, as we understand that term. This useful class of horses, which is now very rare (if it exists at all) in Britain, from saddle-work, which it is best fitted for, being almost entirely superseded by other means of convey-

is still numerous in Normandy, but is there also said to be › decrease.

strong and proper wish, as I have before remarked, seems felt for the preservation of these as well as the heavier s of Norman horses. But the demand for showy horses aux de luxe) has led to the extensive use throughout France se of English breeding. At the same time, most French-feeling on this, as on every other point, a great jealousy ds the English, and a great wish for independence, many rs on the subject press upon the breeders of horses the iety of so modifying the native breed as to supply the nds of the fashionable world, whilst they press upon the , and especially upon its royal head, the nationality of pur-ıg home-bred horses in place of those of England, whilst, h patriotic considerations should prove insufficient, a legis-prohibition of such importation is talked of. They seem to be placed between two dangers—the loss of their excel-preed of horses on the one hand, and the general use of sh horses in fashionable life on the other. By improving native breed, as recommended, they hope to avoid both evils. I think it questionable whether such be not the in a great measure, to incur both; for, on the one hand, it shewn, nor can I think, how they are so to modify their ıan breed, as to suit the fashionable taste, by any other s than the introduction of foreign blood, either already im-d or to be imported; while, on the other hand, by whatever s they succeed in so modifying them, I think they are cer-to lose thereby their present valuable properties—that of verful draught horse in the one class, and of a hardy and kept roadster in the other.

e desire of rivalling the English, even in that breed of s for which they have been so long celebrated, seems to be eeling which has given the chief stimulus to horse-racing in ce of late years. When in Normandy, I found these races f the chief topics of conversation. It was especially so at , the chief town of Calvados, which is the greatest horse-ling department. Besides Caen and Rouen, which take the many other smaller towns in Normandy have their annual . About a-half of the stakes (and at Caen last meeting amounted to nearly £1300) are for trotting matches, partly orses ridden, and partly yoked in two or four wheeled car-s. These prizes for trotting are generally given by agricul-societies. It is generally a condition that the horses shall been bred in Normandy, but with no restriction as to their ree. As to what effect these races are likely to have on the l of horses, (in which light they are generally regarded,) I

shall venture no decided opinion. I may, however, suggest that if the object of agricultural societies be to preserve the most valuable properties of the real Norman horses, (the true national object in my opinion,) they ought, in place of offering prizes for galloping, or even for trotting, rather to offer them for the horse that will pull the heaviest dead load, or carry a man the greatest distance for a series of days.

There are large breeding establishments and depots of stallions for use thoughout the country kept by government.* There are also several private establishments of a similar nature. In one of the largest of these, belonging to M. Bailey, near Caen, I was told that about 300 horses are usually kept during winter. A few of the younger horses (two-years-old) I found feeding, tied in a clover field. The others were in the stable, each going loose in a pretty large stone division by itself. They were almost all under four years old, at which age they are generally sold for the government Haras. They were all, more or less, of English pedigree, mostly from half to thorough bred, and most of them fully sixteen hands. They seemed admirably fitted for supplying the cavalry out of mares of the same breeding, or even out of those of a heavier and more purely Norman breed.

The castration of horses is another question now much agitated in Normandy. It is the usual custom at present among farmers, who generally breed their own horses, to keep them all entire till four or five years old, and then to castrate such as they either wish to retain for labour or cannot dispose of entire. This practice is often found to be a bad one, both from the frequent fatal results of the operation at that age, and from the unmanageableness of entire horses for working even when young. Great efforts are, therefore, being made by agricultural societies in giving prizes for young geldings, to induce farmers to castrate their horses when about two years old. Feeling my inability to give any proper opinion on this important point, I shall not enter upon the discussion of it, but will quit the subject of the Norman horses with this single remark, that I was so much delighted with their present appearance that I should feel very loath to join the movement party at all in regard to them.

From Caen I went through the rich dairy district of Isigny and Carantan in the Cotentin to the seaport of Cherbourg, the most important town of the Departement de la Manche. The peninsula, which forms the greater part of this department, is somewhat

* For some details regarding these Haras, and many other points not touched upon in this paper, I may refer the reader to an article on Normandy, published in the *Quarterly Journal of Agriculture* for June 1841, and this I refer to, though I am aware that he will there find several statements and opinions at variance with mine.

hilly, and bare granite rocks frequently shew themselves. Naturally much less fertile than most other parts of Normandy, it is brought, by careful cultivation, to nearly an average productiveness. In this district is situated the property of General Count de Moncel, well known as one of the most spirited agriculturists, and first adopters of modern and foreign improvements, in Normandy. He keeps several large farms in his own hand, employing about 100 workmen and several overseers. A judicious rotation of cropping is followed on these farms, obviating the taking of two successive grain-crops from the same land, and, by drilled green-crops, the necessity of naked fallows, two of the chief evils still prevalent in Normandy.

Returning from Cherbourg to Carantan, I crossed the peninsula from thence to Grainville on the opposite coast. So far as Contances, the road passes through a country shewing a rich variety of grain and pasture, both interspersed with fruit-trees. In that district limestone is extensively quarried and burned, large stacks of whins being collected round the kilns for fuel.

The ancient town of Contances is prettily situated, and its cathedral of narrow pointed Gothic architecture one of the finest in Normandy—far inferior indeed to that of Rouen in richness, but surpassing it, as well as that of Caen, in purity and uniformity of style.

From Contances to Grainville the soil becomes gradually poorer and more sandy, in many places scarcely covering the igneous almost volcanic-looking rocks which form the sea-coast. This being a barley district, beer is brewed. At the small village of Brehal I drank some resembling, and almost equal to, that made at Prestonpans.

Sea-weed is much used as a manure on this coast. It was also in this district that I saw most generally applied to the land a species of very small-grained sea-sand or marl.* Besides the expense of carting this substance, often many leagues inland, a small sum is paid for it at the shore, varying according to the number of horses or oxen in the carts. Thus it appears that the

* The following analysis of this marl, furnished me by Professor Johnston, shews in what its properties as a manure consist:—

Organic Matter, ...	5.06
Carbonate of Lime, ...	43.50
Gypsum, Common Salt, Oxide of Iron, .	3.43
Insoluble Siliceous Matter, ...	47.69
	99.68

It consists almost entirely, he informs me, of fragments of minute crustations and of the bodies and skeletons of infusorial animals. It is from these latter that silica is derived, siliceous sand being almost entirely absent.

Normans are not behind the peasantry on our own coasts in availing themselves of the auxiliaries supplied by the sea. The sea-marl is usually applied as a compost with farm-yard manure. I was surprised at finding it more generally used in sandy than in stiff clay districts, conceiving, from the state of agricultural science there, that the property for which it was most likely to be prized was that of pulverizing the soil, and not of supplying any chemical ingredients necessary for the growth of crops. On inquiry, however, I found that the peasantry attributed to it quite a different virtue from any I had dreamt of. The reason, they said, why it was chiefly applied to a sandy soil was, that such soil was hot and required the cool sand to refresh it, whereas stiff clays were cold and required lime to warm them. This explanation, however far from scientific, shewed that they had conceived a most distinct and tangible idea of the cause, and had not rested satisfied, as many sets of peasantry would have done, with the mere fact of a real or seeming benefit to their crops from such an application. This circumstance, coupled with the immense labour and expense of the traffic alluded to, is one of the many proofs I have seen that lectures on agricultural chemistry and other scientific as well as practical treatises on agriculture, such as are published in the periodical from which I have so largely quoted, are likely ultimately to produce a great change on Norman agriculture. I need scarcely say that the most important step towards the accomplishment of this is the introduction of more general education among the farmers. The question remains—How is this to be brought about! Is the mere establishment of schools sufficient? No! Were I to attribute to one simple cause the superiority in education and intelligence of Scotch farmers over those in Normandy and in many parts of England, where, in these respects, they class as peasants, that cause would be the general competition throughout the country for every farm in Scotland that becomes vacant. I am quite aware that the competition in the other districts alluded to is often as keen as in Scotland; but the former is confined to a hearsay distance around the vacant farm, while the latter extends throughout the country. Hence, the proprietors in these districts have, in my opinion, in their own hands a most simple and effectual means of bringing about an improvement in the education of their tenantry, viz., by advertising their farms as is done in Scotland. The occasional advertisement of a single farm, by a solitary proprietor, is, indeed, of little effect. The proprietor attains his one individual object in getting an already educated man from a distant district, who pays him a larger rent and cultivates his land better than is done in the neighbourhood. But do the neighbouring farmers imitate him? No. As long

ıan get land on their old easy terms, with the prospect of families following their footsteps, few of them either try to ve their own system or educate their sons so as to enable to learn or to appreciate any other. If, however, large pro- rs generally would act on the uniform system of advertising ɔir farms, with the inducements of leases, good steadings, s they fall out of lease, or as the present yearly occupants ıen their tenantry would be forced to educate their sons so compete with the whole country, seeing that all hopes of g land on the old terms would be shut out. Thus it is r to precept nor to example, but to the general holding out essity, that I look as the chief means of inducing the farmers h backward districts to attend to the education of their ᵂhom they wish to follow their profession.

ı system of creating competition for farms by advertisement, ıbt, often leads to bad results, in Scotland, both for landlord ınant, but this is only in cases where the proprietor clutches very highest rent offered him without the least regard to the capital, character, or skill of the tenant, and which is ıse and not the proper practice of the system.

superiority in education of the Scotch farmers, as well as ıtry, over those of most other countries, is, I think, too ively attributed to the superior opportunities afforded them educational institutions, and too little importance is put ɔumstances such as those above alluded to, which are neces- ɔ induce the people to avail themselves of these opportu- In Normandy, I believe, there is a school in each com- which is a district of about equal population with a Scotch . For these schools the teachers are regularly trained in l schools. Some little instruction in agriculture and horti- ɔ is said to be given in these schools, of which we are only lking in Scotland. The following question proposed for ıion at one of the meetings of the Normandy Association ıew that it is proposed to render this more effectual:— ıt kind of agricultural instruction," it is asked, "is given to rs in the normal schools? Is it sufficient, or is it not time ler it more perfect, and to oblige the primary teachers to onferences in the country, at which agriculturists of all ıight attend?" Whether instruction, either in the science ɔtice of agriculture, can be given by any such teacher with- ɔ neglect of other necessary lessons, is a question on which ıot enter, but which will probably soon receive a practical in Scotland, either to our advantage or to our cost. The model farms throughout France kept by government, ıere pupils are taken, form another and more important of obtaining an agricultural education.

The wages of labourers seem to be lower in France, eve proportion to the low price of provisions, than in England. General Council of the different departments fix tariffs for re lating the price at which different services shall be convert into money. By these the price of a day's work of a labou man is rated generally at 10d., never higher than 12½d., sometimes as low as 7½d.; that of a horse or mule from 10d 12½d., and the hire of a two-wheeled cart from 10d. to 15d. Th low rates of payment render the waste of labour of men and hor so much reproached by the Scotch to their neighbours, less a nishing in France than in England, where it is sometimes car to a greater extent. In ploughing, a man usually works th horses in Normandy, and only two men accompany the largest m chant waggons, one driving and the other sometimes asleep in fr or in the hammock below. Frequently, however, one sees st men employed at such work as a woman, or even child, m quite as well perform, such as weeding corn with the wo pincers used for that purpose, or herding a few sheep or gee the road sides.

Having finished at Grainville a most agreeable tour thr the happy province of Normandy, in which I sought rathe fertile than its picturesque parts, I crossed from thence t rich and beautiful little island of Jersey. I will now bid to Normandy, the land of our forefathers, with the express a hope that it may go on increasing in wealth and fertility the present comfortable and contented appearance of its bitants may suffer no change; and that no innovating han ever be lifted up against any one of the many objects in it, erated either by religion or antiquity—from the sacred edi the picturesque and imposing head-dress of the females— where such is essentially promotive of real improvement.

THE FARMERS' NOTE-BOOK.—No. VII.

Top-Dressing Lawns with Peat. By Mr Peter Mac West Plean, Stirling.—When lawns become worn out, t y repeated cuttings, the grass becomes weakened, and of it dies—mosses often take the place of grass and clove he place intended for perennial grasses becomes occup *hypnums* and *polytrichums*; and it often happens that co ble labour is bestowed upon the ground, as well as mo pended, to restore the grass to the dark-green colour d Sometimes the ground is trenched and limed, and no littl s required to bring it to a uniform solidity of surface bef

sown, whereby expense of seed and frequent rolling, while ss is growing, are incurred, and a considerable time is lost the grass is ready for the scythe. When turfing is resorted h more labour and expense are required. Now a great ion of this labour and expense might be avoided by judi- p-dressing.

e who would keep lawns in a healthy state ought to know ing about the functions of the roots and leaves of grasses. een ascertained that the spongioles of roots are employed n procuring food from the ground. Leaves have also their perform in the welfare of the plant, whether it may be by ion, perspiration, or digestion; and when leaves are fre- cut, the plants become injured: moreover, when little ment is imparted to the roots, as is often the case where kept short, the plants become weakly, and at last die out exhaustion. No doubt gardeners know that top-dress- nefit lawns, but the manner in which materials are some- ised for that purpose deter them from employing them A mixture of earth and lime will do good to grass when upon it in a proper manner; but the rough state in which ubstances are left, even after being well rolled, takes the f the scythe, which is a very provoking thing to a mower. is a substance which I have already recommended for purposes, and I hope the reader will bear with me when it before his notice again. It may be used with much ge as a top-dressing for lawns when properly decomposed. at should be well broken up, frequently turned, and l with soap-suds, urine, or drippings from dunghills, effects will soon be observed, after a shower or two, in the yellow sickly leaves of the grass into a pleasing dark As a top-dressing for lawns, it has a great advantage rder materials: it does not injure the scythe when it in contact with it, and in seasons like last summer, when t cutting made the ground bare and hard, injured the nade the leaves become brown, and the lawn assume an a wintry appearance, a top-dressing of prepared peat eat measure would have prevented the withered aspect. at of itself acts as a covering to prevent the earth from g, and the nourishment it contains strengthens the plants, bles them to overcome the scorching heat of summer.

t not the farmer use such a top-dressing with profit? t entering at all upon what has been advanced for and top-dressing pasture-land, I will simply state a few facts ve come under my own observation, leaving it to others of perience to judge of their utility or not in farming. An

enterprising farmer in the neighbourhood of Stirling, last summer, top-dressed part of a pasture field with peat that had been soaked with drainings of the dunghill. The part of the field on which the peat was put was of a gravelly nature; and although other substances were spread upon other parts of the field, none of them produced so abundant a crop as the prepared peat, and the cattle ate it freely. About the middle of August, this year, (1844,) I tried some of it upon very stiff clay-land. The grass upon the land was thin, and not of a healthy colour. The peat I used was steeped in urine; and it was not long in changing the appearance of the grass. I cut the grass about the beginning of November, and it yielded at the rate of 9 tons 14 cwt. per acre; while from a similar space of ground, that had no peat applied to it, gave only at the rate of 1 ton 4 cwt., and, in regard to quality, was very inferior.

There is no harm in using one's eyes as long as one has them, and I can see well enough that many pastures begin to fail about the end of August, when the usual quantity of milk falls off, and when many plants in the fields gain strength that cattle do not eat, or care little about eating—such as self-heal, the different species of crowfoot, sneezewort and yarrow, bartsia and eyebright, yellow-rattle and cranesbill, and many others that could be named; and from such pasturing the plants are weakened—weakened in two ways—first by the cattle eating the leaves, and secondly, by the weeds overpowering them. Now there can be nothing wrong in affording a little assistance to the weak and useful grass plant, that it may not be trodden into the earth by the feet of cattle, or suffocated by the embrace of the *Ranunculus repens*, or deprived of its food by the coarse-feeding dock, thistle, or ragweed.

There are yet many places in the United Kingdom where may be seen drains for leading off the urine from stables and cow-houses, and drainings from dunghills, into the nearest brook; and there may not be far off thousands of cubic yards of good peat, that are regarded as an incumbrance, producing only stunted heath and a few bog plants of very little value; and between the cow-house and the peat there may be seen a few lean cows busily employed in picking up a scanty subsistence from a poor pasture. Now what a happy thing it would be were the peat and the urine united together; and I suppose it would not matter much whether the union were effected by chemical or mechanical means, so that the substances were rendered useful upon bare pastures. There is no doubt that cows would feel the benefit of 8 tons extra per acre of good grass to eat between the middle of August and November. Such an additional supply of food would

manifest itself in the dairy, and be the means of increasing the comfort of the dumb animal.

When urine is wasted, it is so much money thrown away or manure lost to the soil. Even a top-dressing with lime does not at all times answer the expectation of the farmer; and the expense of liming, allowing 120 bushels to the acre, will probably cost, upon an average, £4 : 10 or £5, including the cost at the kiln and driving; and as there are more nourishing bodies required for vegetation than carbonic acid, it will often be found that other materials, spread upon the surface of the ground, will cause a heavier crop to grow than lime; and when it is known that so many substances, necessary for healthy vegetation, are to be obtained from urine, the importance of using it will be easily perceived, and how to apply it properly should occupy the attention of every cultivator of the soil. By many the value of liquid manure is fully appreciated and turned to good account, and there are different ways of using it. When applied to pasture-land from the liquid manure cart, unless the soil is of a porous nature, much is lost by evaporation; but when taken up by well-broken peat and spread upon the ground, the plants receive it longer, and perhaps in a more regular way than giving it all at once. Various opinions are held by individuals respecting the proper time when land should be top-dressed, some maintaining that it should be applied when vegetation is in a dormant, others when in an active state. Perhaps the best time to apply prepared peat to pasture would be in the month of August, when the summer supply of food is beginning to fail, and before the temperature of the earth and the heat of the sun have been reduced. Food would then strengthen weakened vegetation, and a few extra tons per acre of good grass would be of great benefit to cattle before the frosts and snows of winter set in. It is nothing in favour of the farmer to make cattle seek their food with difficulty, as has been proved by experiment; neither is it a good thing to overstock land with cattle, which is, perhaps, one of the ways to make the least of pasture. If the plan of top-dressing now recommended has any effect in putting that which is allowed to go to waste into proper use, and thereby benefiting the agriculturist, my object will be attained.

The Comparative Applicability of the Aberdeenshire Scythe and the Common Sickle in Cutting Laid Crops.—In these days of scientific research and mechanical invention, many benefits have been conferred on agriculture by the removal of a large amount of prejudice against things new or strange, by which a fair trial generally is obtained for all suggestions bearing the semblance of improvement. The continuance of this favourable state of feel-

ing may be endangered by the exaggerated statements with which new methods or inventions are propounded. A manure, for instance, found to be highly beneficial in one locality is held up as being universally so; and an implement useful and valuable in some situations is declared to be generally so. The merits or demerits of each proposed improvement not being clearly or sufficiently defined, its subsequent failure in any case tends to damp the zeal with which even really useful matters are received, and to strengthen prejudice against it.

Having at intervals seen, in the pages of this Journal, and in those of the Transactions of the Highland and Agricultural Society, startling statements as to the great superiority of the Aberdeenshire scythe over the sickle and scythe-hook for reaping grain crops of all weights, both as regards economy and despatch, and having frequently used the long-handled scythe in cutting grain as well as hay, but never with satisfaction as to the completeness of the whole work where the crops were lodged, I had recourse to the short-handled scythe of Aberdeenshire, putting it into the hands of our own workmen, and found, after a trial of several seasons, (except in the lightest crops,) neither the amount of work, style of execution, or saving of expense, such as to induce its continuance. Thinking that our own scythesmen might not have been sufficiently trained to the right use of the implement, or expert enough in its application, whilst those who formed the sheaves might not have acquired the requisite dexterity possessed by those who had been long employed at it, I asked a friend to engage for me for the harvest of 1843 two mowers and two gatherers from Aberdeenshire, so that I might practically test the applicability of the implement to the cutting of our crops of wheat, barley, and oats, and introduce amongst our own work-people the superior acquirements evinced in that county.

The harvest had commenced before their arrival. Their first start was in a field of barley, an average crop, mostly standing, some of it laid, but not twisted. The surface of the ground was flat, with merely marks for furrows, and, saving that the crop was rather ripe, a better than average situation. There being little wind, many stalks were left and intermixed. It was very low cut, except where lodged, and where much of the stubble was passed over to drag in sight, with the rake, many ears which found their way into the stubble end of the sheaf. On the whole, the first day's work did not come up to my expectations or conception of how the work should be executed. Next day a slight breeze favoured their operations; the sheaves were clearer of stray stalks, and the raker had less to collect; but the extent of ground gone over was only three-fourths of a Scots acre to each scythe. They continued cutting barley for several days. So soon as a light field

ats was ripe, they entered on it, and here they seemed more home. The straw was short, and it was very low cut; no e ears left in the stubble ends of the sheaves than when cut h the hook, and very few rakings. The appearance of the le was satisfactory, yet there was not more than one Scots e cut by each scythesman per day, working ten hours. From last field they removed to a bulky field of oats, laid, twisted, l tangled many ways; the ground was good, being smooth, free n stones, and no deep furrows. The standing portion was mand in a tolerable manner, but little progress and imperfect work made with what was laid. When the weather was quiet, it painful to see the destruction of grain caused by many stalks ng back after being cut, mixing amongst the swathe and lding their grains, a disadvantage detracting very much from profit arising from the additional length of straw obtained; in this field there was no other saving, the time taken being ut the same as an equal number of Irishmen took to cut it ı the hook. No extent of wheat was cut with the scythe.

'he two men were stout, active, and ready fellows, by no ns lazy, and anxious to acquit themselves well. The gatherhad been trained to it from the time they could work. On conclusion of the mowing, I had them employed for two weeks he usual harvest labour, and found them all no ways inferior ur own hands. Each scythesman had 2s. 6d. per day, the ierers 1s. 8d., with lodging, and their passage paid from and to rdeen, but they provided their own living. In order to form a parison of the expense of reaping with the scythe and hook his situation, I may state that the average rate of wages paid shearers for the last four years has been 1s. 4d. per day with uals, or 2s. 1d. without; and finding that, in the cutting of Scots acres of wheat, barley, and oats each season, that it iired 4½ people to shear and bind one acre; and taking ⅗ths n acre as the average work performed by each scythesman imilar descriptions of crop, we have

1 acre Scots, cut with the scythe, costing	£0	9	3¼
1 acre Scots, cut with the scythe-hook, ...	0	9	4½

)f course, had there only been oats to cut, or light oats barley, the expense of mowing would have been much less ı shearing—a fact which, on reflection, is quite easily ounted for; because the scythesmen, meeting with no intertions in such crops, can expend all their force with most t, and the additional power conferred by the larger imnent can be fully applied. When the crops are laid and ted, the case is materially different—the powerful leverage of scythe is lessened, the mower must be constantly making

fresh openings, cutting much of it twice over, and seldom has a full, free, unhampered sweep. The shearer, with his scythe-hook, shifts his position easily, and loses no power in applying it. Such being my experience of the Aberdeenshire scythe, when managed with men trained to it, I can therefore understand the reason for its being so little used for cutting the strong, tangled, twisted crops of the Lothians or Carse of Gowrie, and in such situations the scythe-hook is, everything considered, certainly to be preferred.

Although I have never seen the extent of work either on my own farm or elsewhere performed by the scythe as represented, I am convinced that it is a cheaper and more economical mode for cutting light crops than the hook. This season (1844) I had another opportunity of comparing the difference of the two modes, in a field of 50 acres of light oats, with a good sole, there being a smooth surface to cut upon, and a small quantity of grass where the crop was thinnest, enabling the scythesman to gather even the lightest corn well in, and there a band of fourteen Aberdeenshire people cut 38 acres Scots in eight working days, in a very satisfactory manner; no more ears being seen on the out side of the stacks after being put up than the shorn ones, and the stubble was more equal and lower than the other 12 acres that had been cut with the hook. The number of shearers required to cut and bind these 12 acres was under 4 per acre, and, taking 3 as the number required to mow an acre, we have

1 acre mown, 3 people at 2s. 1d. per day, . . .	£0	6	3
1 acre shorn, 4 people	0	8	4

In reality, the sum paid the tacksman for mowing was 10s. per acre, but as he brought the people from a distance, running risks of bad weather, and as all the crop he cut did not prove so favourable as this field, he would not profit greatly; and in this locality a good scythesman would cost 3s. per day, reducing the difference in favour of mowing to 1s. 2d. per acre, which, with the greater weight of straw obtained, is a sufficient inducement to recommend its adoption in like circumstances. My experience this year is also equally conclusive against the scythe in economy or despatch in cutting laid crops, such as a great portion of the Lothians presented, and which opinion was coincided in by the Aberdeenshire mowers I had the opportunity of meeting.

J. M.

Sheep. By JAMES H. FENNELL.—So greatly do the several varieties of the common sheep differ from each other in external form and clothing, that we know not which of them to regard as most characteristic or most indicative of the original wild type

from which they have descended. The wild mouflon of Corsica (*Ovis musimon*) is regarded by most naturalists as the type of all domestic sheep, but others consider it to be the type of merely those of Europe, and that the argali of Siberia (*Ovis ammon*) is the type of those of the East.

It has always appeared to me (says Mr Blyth, in a valuable memoir on the various species of sheep) that, though the character of the horn of the mouflon (*Ovis musimon*) is nearly the same as that of the domestic ram, the mouflon is obviously of a distinct species, and I doubt whether it has contributed at all to the origin of any tame race. That it interbreeds freely with the latter, under circumstances of restraint or confinement, is well known; but we have no information of hybrids being ever raised from wild mouflons, though the flocks of the latter in Corsica and Sardinia will occasionally graze in the same pasture with domestic sheep, and all but mingle among them. Assuming that different species have commingled to produce the domestic sheep, (as appears to be very evident in the instance of the domestic dog,) it is still remarkable that we have not yet discovered the principal wild type, or indeed any species of wild sheep with so long a tail as in many of the domestic breeds, which I cannot doubt existed also in their aboriginal progenitors. Nothing analogous is observable among the endlessly diversified races of the domestic goat, which all appear to have been derived exclusively from the Caucasian goat, (*Capra ægagrus*.) A wild species of sheep, presenting a near resemblance to the domestic race, exists in Central Persia, and has, according to Sir John M'Neill, horns much more nearly resembling those of the domestic ram, being spiral, and completing more than one spiral circle. It may prove to be a wild type of the domestic sheep, thus inhabiting the same range of mountains as the wild common goat. It should not be forgotten, however, that Hector Boëthius mentions a wild breed of sheep in the island of St Kilda larger than the biggest goat, with tail hanging to the ground, and horns longer and as bulky as those of an ox. Pennant remarks that such a sheep is figured on a bas-relief taken out of the wall of Antoninus, near Glasgow. Two skulls of sheep, apparently male and female, from the Irish peat, in the Earl of Enniskillen's possession, and exhibited some time ago at a meeting of the Geological Society, are probably of this race. Of all the wild species of sheep, the rass of Pamir approaches nearest to the domestic sheep in the character of its horns, though differing in one particular, besides size, that has been pointed out, namely, that the two front angles are about equally developed; whereas, in the common sheep, as in the mouflon, the inner angle is more acute to near the base. Some experience in the deduction of the specific characters of sheep-horns enables me to state with confidence that the normal character of the long-tailed domestic breeds of Europe, and also of most other breeds, is intermediate to that of the rass and that of the mouflon, combining the flexure and the prolongation of the former with the section of the latter, but becoming proportionally broader at the base than in either; more as in the argalis of Siberia, Kamtschatka, and North America. That the domestic sheep is totally distinct from all, I have been long perfectly satisfied, and examination of the rass, in particular, has strongly confirmed me in this opinion. I think it likely, however, that more than one wild species have commingled to form the numerous domestic races, though certainly not any of the wild species I am acquainted with. It is not very long since the question was repeatedly discussed, whether the tame sheep had descended from the argali of Siberia or the mouflon of Corsica; and now that so many more decidedly distinct wild species have been added to the catalogue of the genus, it is probable that we are still very far from having ascertained the complete existing number, but that several more yet remain to be discovered upon the lofty table-lands and snowy mountains of Middle Asia, from the Caucasus and Taurus to the Altai, and among them, it is very probable, some much more nearly allied to the domestic races than any at present known.

All true species of sheep differ from goats in possessing suborbital sinuses and interdigital fossæ. This difference between

goats and sheep appears to have been first noticed by Pallas and has since been descanted upon by Professor Géné, in the *Memorie della Reale Academia della Scienze di Torino*, (vol. xxxvii.) The fact of so slight a distinguishing structure in genera so nearly allied in habitat as the goats and sheep, renders the problem of the utility of these sacs or fossæ between the toes somewhat difficult of explanation.

It has been questioned whether the sheep is *naturally* a woolly or a hairy animal. The prevailing opinion of naturalists seems to be, that the sheep is by nature both woolly and hairy, that the hair would predominate, but that, owing to the nature of its artificial state, the growth of wool is chiefly promoted in our flocks. Mr Youatt, on examining a small portion of the pelt of an argali which died in London, and was said to have a winter coat, at least, of fine woolly down, found that the hair was long and coarse, with an exceedingly small quantity of crisped wool at the base. There was so little of the wool that it could scarcely be detected on the pelt, but was clearly seen when a lock of hair was cut off close to the skin, and held up to the light. This goes far to explain the accounts that have been occasionally given of perfectly hairy (domestic) sheep. Thus it would seem that the sheep has naturally, like the generality of wool-bearing animals, as the beaver, the otter, the hare, &c., an outer garment of smooth hair, and an inner one of wool. However this may be the ordinary domestic sheep of Europe are wool-clad, except on the face, ears, and limbs, which are covered with true hair. In the more neglected breeds, the primitive clothing declares itself in the long hairs with which the wool is more or less mixed. The actual cause of the wool predominating is involved in much doubt. Shelter and warmth, instead of promoting the growth of the lighter dress of hair, seem to increase the wool. This is particularly observable in the Merino sheep of Spain, originally imported from England, and the flocks of Australia and South Africa. If the fleece of the primitive sheep consisted of hair and wool, it seems probable that the ancient shepherds selected for breeding those individuals on which the wool happened to predominate, the quantity of hair being smaller than usual; and that, by others imitating this example, the sheep gradually attained to its present condition of a permanently established wool-bearing breed. This seems to have been sooner effected than we might suppose; for we find that, at a very early period, wool was used in the manufacturing of various articles; at first, as may be concluded, by the simple process of felting, afterwards by spinning and weaving. It appears also certain that the domestic sheep was originally of a brown or rusty-black colour, a hue still lingering on the limbs and faces of many of our breeds.

ometimes distinguishing individuals amidst a carefully-bred by being their general colour; and thus they exhibit a conional tendency to return to their wild origin.

e fleece of the sheep being naturally a mixture of hair and it is not surprising to find examples, occasionally, in domesd flocks, of the hair so greatly predominating over the wool hey may be aptly called hairy sheep. The hair is somelong and silky, like that of a spaniel, and many of the of the Bucharian Tartars are thus clothed; sometimes it rse and shaggy, as in varieties of the Guinea sheep. Sir h Banks imported three sheep from Spain, which were as th and sleek as a horse, and which never shewed the least of wool or down, even in the most minute quantity. In the h volume of the *American Philosophical Transactions*, p. 149, nderson states that, on visiting a Danish East Indiaman put into Leith Roads on her return home, he found on l "a very fine sheep, which was covered with a close coat of short hair, very smooth and sleek, like the coat of a welled horse, but the hairs rather stiffer, and thicker set on the the colour a fine nut-brown. It was reported to have been ght from Madagascar, and that all the sheep found in the l were of the same sort." A mixture of short coarse wool air forms the covering of the fat-rumped Persian sheep.

r several different breeds or varieties, distinguished by dift qualities, both as regards their form and the characters of wool, are the result of skilful treatment, of peculiar pasturand of judicious crossings. No animal varies more than the , and none so speedily adapts itself to climate. It would st appear that Nature, convinced of its great utility, had wed upon it a constitution so pliant as to enable it to accomte itself to any point in a wide range of temperature; for it ccompanied man to every quarter of the globe, be essed at every change with some peculiarity, alt only change of situation, and varying, we might also with veather; for where the temperature is equa does nimal preserve an atmospheric stamp, and d rts ter the breed; while, under a fluctuating sky, will, though, in this case, continued exer are cure them for any length of time in an un

Western has succeeded in producing a l of sheep, by placing the Merino wool upon ; and some specimens of this breed were exhibit by e of the Smithfield shows. His Lordship intermix reeds of long-wool sheep with the pure Merino; the ter hich, by the attentive efforts of many years, ed in carcase, that it has become an exceedingly

animal, in point of substance and size, to those which are generally seen. In 1838, he had a flock of about a hundred breeding ewes of this crossed species, and they so closely resembled each other in countenance, the appearance of their wools, and their relative sizes, that no very variable character could be discerned among them; certainly quite as little as is to be found in other flocks which are stated to be of a pure specific breed. Some years ago, Mr C. T. Town of Weald Hall having put a handsome ram, half Leicester and half Cheviot, to some Merino ewes, obtained excellent lambs. From these he selected the best rams, and by putting them to the same breed of first crossed ewes, he established (or as he termed it, *created*) a distinct and valuable sort; in fact, a new breed of sheep. As long as a similar course is pursued, similar results will follow from other breeds.

Farmers seem to be but little aware of the vast variety of resources they possess for feeding sheep. They will readily eat and thrive upon numerous sorts of food beside their ordinary pasture and hay, clover, rye-grass, sainfoin, turnips, carrots, and cabbages. We have observed them browsing upon the leaves of the holly, the bird-cherry, the privet, the tender tops of heath, osier, and furze. Dr Anderson, who devoted much time to rural affairs, cultivated furze for the express purpose of feeding cattle and horses. He sowed from fifteen to twenty pounds' weight of seed per acre, in a field of good dry loam, along with a crop of barley. "Sheep," he says, "take to this food very kindly when they have once been accustomed to it; and if the seed be simply sown broadcast, very thin, (about a pound of seed per acre,) upon the poorest soils, after they come up, the sheep of themselves will crop the plants, and soon bring them into round close bushes, as this animal nibbles off the prickles, one by one, very quickly, so as not to be hurt by them. Sheep, however, that have not been used to this mode of browsing, do not know how to proceed, and often will not taste them. But a few that have been used to the food will soon teach all the rest how to use it." For sheep that are afraid of the prickles, the furze should be bruised in a mill, or under a heavy roller. As a fodder plant, furze ought certainly to find a place in the sheep's bill of fare. In mountainous countries, where the snow lies sometimes upon the ground for many weeks together, the leaves and branches of the Scots fir afford a very wholesome nourishment to the sheep. The leaves and young branches of the jasmine are eaten by sheep with great avidity whenever they can obtain them. Mathew Aphonin, a Russian naturalist, recommends the sheep's fescue-grass (*Festuca ovina*) as their best fodder, saying that "they fatten upon it sooner than on any other plant. This is evident in Gothland, where it abounds, and hence appears the reason

r all repair with such avidity to the almost barren places grows." A variety of the common spurrey, called *sativa*, is cultivated in some parts of Germany for hich are stated to be fond of it. They are said to eat mon fumitory, (*Fumaria officinalis*;) but Holditch, in l *Essay on the Weeds of Agriculture*, (1825,) p. 56, says the course of his experience he never observed them r disposition to touch it. Mr Main assures us that the und stems of that common and most troublesome weed, ass, are, when washed and dried, eagerly eaten by sheep, e most nutritious to them. The seeds of the sun-flower, ltivated to a considerable extent, are capital food for In the neighbourhood of Geneva, horse-chestnuts are collected, being highly prized as food for sheep that are g. Each sheep is allowed, morning and evening, about ıds' weight of these nuts, after they have been well or cut up by a machine kept solely in Switzerland for ose. This food is greedily eaten by the sheep; but as to disagree with them, it being of a heating nature, it regularly portioned out to them. It is reported to imch flavour to the meat; and Geneva mutton is noted for s highly-flavoured as any in England or Wales. We ' mutton of huge Leicestershire pease-fed sheep, as rank ie-goats," in Shadwell's play of *The Woman Captain*, d in 1680. It is doubtful whether our sheep eat wild lthough it often grows profusely in places where welll mutton is fed. Weston, in his *Tracts on Agriculture*, attributes the peculiar flavour of the Banstead, Down, ndsor Forest mutton to the sheep feeding on wild nd other aromatic herbs which grow there. In Spain, ino sheep have been noticed, when grazing leisurely, o prefer the finest grasses, never touching the aromatic ınd if wild thyme and such herbs be entangled with the hey will separate them with great dexterity; but, if ted, as happens on the approach of rain, when the dogs are drive them to shelter, the sheep, in their hurry, will verything, even poisonous plants.

will sometimes eat animal matter. It is recorded that ender for a lamb, which a ship's company had on board, consumed, it was offered flesh, and gradually acquired elish for this new aliment, that it could never be prevailed ıt anything else. Borlase, in his "*Natural History of l*," (1758,) ascribes the superior flavour of the Cornish to the sheep feeding upon snails—meaning, I suppose, y swallow them not by choice, but unavoidably along with age. "Snails of the turbinated or spiral kind," he says,

[illegible]

[illegible] herbs for s[illegible] be given [illegible] w[illegible] salt [illegible] digest vi[illegible] Salt is so essential t[illegible] that it is a matter of daily observation [illegible] of their own accord. In some countries they [illegible] want of this stimulus to the digestive organs. [illegible] of South America salt is very scarce; and in the sta[illegible] the sheep and cattle, when they discover a pit of [illegible] together to feed upon it, and many are trodden t[illegible] struggle. Man himself obeys the same law as these [illegible] in showing so strong a desire for the saline and mine[illegible] by regarding them as powerful restoratives and pres[illegible] health. To what but this cause do Cheltenham, L[illegible] other places owe their celebrity. Professor Liebig [illegible] how it is that salt is so important and necessary a[illegible] the food of animals. "Salt is a chloride of sodi[illegible] the chlorine it contains goes to form the gastric [illegible] so important an agent in digestion, its soda go[illegible] bile, which is a compound of soda. The bile is, in [illegible] any combination, by which the carbonaceous mat[illegible] in contact with the oxygen, in order to be burnt. [illegible] of "Spain Yesterday and To-day" says that the Spa[illegible]

t this predisposition from their progenitors. The s of this breed belonging to the Tartars evidently eding on the herbage of the saline parts of the steppes. is excellent for sheep, when put on turnips early in By giving it them in the wet and rainy autumn of Sommerville did not lose a single sheep, though his suffered considerably. It has been recommended sheep are suffering from the rot, they should be taken heltered yard, and given each a dessert spoonful of salt, head of the animal upwards, when the salt is in its two or three minutes, until it is dissolved by the saliva, l down into the stomach. Keep them a few hours and give them dry food, bran, cut hay, a little bruised id a few cut Swedes; among any of their food, give tion of salt constantly. If they do not at first take o freely, in consequence of the admixture of the salt, quantity administered and give them a second dose, 'st; on the second or third day they will soon take it gh in their food. This will in a great measure cleanse i and intestines of those crudities that often lodge d though it may not accomplish a perfect cure, where is very bad, it will stay its progress and give time for ie animal, and thus mitigate the severity of the loss. ing sheep, if taken early, it often will by judicious it prove an entire cure. Baron Schultz recommends stroy the fluke-worm (*Fasciola hepatica*) in sheep. e it may be mentioned that parsley is good for sheep ffering from either the fluke-worm or the rot, provided l twice a-week, for two or three hours each time, on which has been cultivated in fields purposely.

of Dilston has stated that he has fed sheep in sheds, ie advantages he derived were overbalanced by a virue of the feet, which was either the foot-rot or some n of it.

tatement Mr Martin Doyle makes the following obser-

ture has been assigned as the origin of the foot-rot, and, I venture od reason. Moist pasturage in a warm season of the year induces it becomes noxious to sheep, from the circumstance of their lying with d under their hearts, in the manner most calculated to produce great ure, which also affects their bedding in the sheds, and generates, in nion, an ailment similar to, if not identical with, the genuine foot-rot. f this nature does not arise (unless infectious matter has been deposited ground by other sheep) in flocks that have a short dry pasturage, and y of range. It is on rank grass in low land, and generally moist pasfoot-rot is found to exist. Sheep that have a considerable way to walk ieir food escape this affliction, which, like the gout in the human race, ttendant on a life of sloth and voluptuousness. They may have galled ravelling, but not the foot-rot, which seems to have been the effect of the

increased weight and consequent inactivity of the large varieties. I am aware that a different theory has been adopted by eminent veterinarians respecting the disease—that some high authorities among them attribute it to the deformed structure of the hoof from overgrowth, through want of the friction which rough land supplies to pare it down, or the neglect of the shepherd to trim it with his knife—but I cannot conceive that the distorted form of the hoof occasions the malady in question, which appears with far more probability to arise from moisture under the particular combinations calculated to render it the chief agent in developing the ailment. Neither Mr Grey's remarks nor mine tend in any degree to prove that sheep in actual preparation for the butcher may not be house-fed with great advantage on Mr Childers's system, while they harmonize with the convictions of those sheep farmers who consider that exercise is essential to the health and hardihood of their flocks, and that close confinement in sheds and small yards, in a state of unnatural warmth, and amidst the effluvia which arises from fermenting litter, must be more or less prejudicial to sheep, excepting those which are to be transferred at once from their prison to the shambles.

Every action of the body, yea, every thought of the mind is attended with chemical change; a portion of the deposited tissues are thus being constantly consumed. Hence it is that quiet and inactivity are highly conducive to the fattening of animals. A knowledge of this fact suggested the cruel practice in fattening geese, of nailing their feet to the floor, and of cooping pigeons and chickens before they are killed. When prizes are given by our agricultural societies for fat, and not for symmetry, the animals are strictly prevented from taking any exercise at all. Mr Childers found that sheep, which were kept warm and quiet, fattened much faster than those that were allowed the open air and action. It is very difficult to fatten sheep and oxen in July, because at that time they are in constant motion, owing to the flies stinging them. The influence of warmth and quiet in fattening sheep has been very satisfactorily proved by Lord Ducie's experiments. In his first experiment, five sheep were fed in the open air between the 21st of November and the 1st of December. They consumed 90 lbs. of food per day, the temperature of the atmosphere being about 44°. At the end of this time they weighed 2 lbs. less than when first exposed. In the second experiment, five sheep were placed under a shed, and allowed to run about at a temperature of 49°. They consumed at first 82 lbs. of food per day, then 70 lbs., and at the end of the time had increased in weight 23 lbs. In the third experiment, five sheep were placed in the same shed as in the last instance, but not allowed to take any exercise. They ate at first 64 lbs. of food per day, then 50 lbs., and increased in weight 30 lbs. In the fourth experiment, five sheep were kept quiet and covered, and in the dark. They ate 35 lbs. per day, and were increased 8 lbs. The natural temperature of the sheep, as ascertained by applying the thermometer to its body, varies from 100° to 103°, being the same as that of oxen, swine, dogs, and cats. In other words,

these animals are from two to five degrees warmer than man, whose ordinary temperature is 98°.

The ewe goes with young five months, and, in Britain, usually produces but one at each yeaning or birth. A traveller, speaking of the grass of Pamir, remarks that "its nourishing qualities are evidenced in the productiveness of the ewes, which almost invariably bring forth two lambs at a birth;" but I think that the most *universal* and *natural* number for the ewe to produce is, in fact, two. Occasionally, and even in England, more than two are produced at a birth. The *Lincoln Gazette* of April 2, 1839, recorded that an ewe, belonging to Mr Stacey of Bothamsall, near Retford, had, in the course of six years, yeaned as many as sixteen lambs, twice producing twins, and three annually during the last four years. The ewe herself was one of four from the same mother, and had been brought up as a *cade*, that is to say, it had been weaned and reared in the house. In Barnaby Googe's translation of Heresbasch's "Foure Bookes of Husbandrie," (1586,) p. 139, we read that "it hath been seen in Gelderland that five ewes have had in one yeare twenty-five lambs: it may seem, peradventure, to many incredible, and yet it is not a great marvaile, since they have twice a yeare *mostly two*, and sometimes six at a time." The *Journal de Mayenne* stated, in April 1842, that an ewe at Charne, near Ernée, had lately given birth to eight lambs, four of which were still alive.

Tusser, in his "Five Hundred Points of Good Husbandry," (1562,) mentions that in his time ewes were milked in England, and that five ewes were reckoned equal in value to a cow, which fact, together with his statement, that a sow was also considered of the same value as a cow, shews the then inferior state of agriculture, the low value of the cow arising from the difficulty of procuring winter food.

Some breeds of sheep are valuable for both mutton and wool; some are chiefly prized for their wool only; and others chiefly for their mutton and the readiness with which they may be fattened. Donovan says "the sheep is in its best condition, as food, when five years old—an age which it is almost never allowed to attain, unless when intended for the private use of the owner, and not for market. It is then sapid, full-flavoured, and firm, without being tough; and the fat has become hard. At three years old, as commonly procured from the butcher, it is well-tasted, but is by no means comparable to that of five years. If younger than three years it is deficient in flavour, and its flesh is pale. Meat which is half mutton and half lamb is very unpalatable food." The famous writer on cookery, M. Ude, advises us always "to choose mutton of a dark colour, and marble-like." In some foreign countries the flesh of the sheep is not eaten, or

only to a small extent. It is supposed that mutton was unlawful food to the inhabitants of the Thebais. Cap a Bird, in his "Description of the Azores," says that in those parts sheep are only bred for the wool, the inhabitants rarely eating the flesh. When Caligula had a number of Jewish prisoners brought before him, he inquired of them why they refused to eat pork. The Jews replied that the habits of nations differ, and that some persons do not eat lamb. "They are right," said the Emperor, "it is a tasteless meat."

Old Fuller quaintly remarks that "the sheep feeds more with his fleece than with his flesh, doing the one but once, but the other once a yeare, many families subsisting by the working thereof." Tytler, in his "History of Scotland," says that, five hundred years ago, the Scottish proprietors bestowed most attention on rearing flocks of sheep. "Indeed, sheep chiefly abounded in the Lowlands; and during the latter part of David the Second's reign, the parliament interposed in order to equalize the taxation of the districts where sheep-farming was unknown, and the Lowland counties, where the wool-tax fell heavily upon the inhabitants; while, on another occasion 'white sheep' were exempted, probably meaning those sheep which, for the sake of producing a finer quality of wool, had not been smeared with tar. In a short time, however, the northern as well as the southern districts abounded in sheep, which became a principal source of the wealth of the country." In a Greek manuscript, deposited in the Bodleian Library, and written by Nicander Nucius, who visited England in the reign of Henry the Eighth, it is noticed that the English "export annually from the island the wool of sheep to an immense extent, and no small revenue accrues to the King rom this."

Sheep seldom exceed the age of ten years, though James Hogg, the Ettrick shepherd, mentions a black ewe that died at the age of seventeen, at Harehope, in Tweeddale.*

Holdich's Weeds of Agriculture. By Mr MAIN, Old Brompton.—Having been turning over the last 8vo edition of the *Hortus Gramineus Woburnensis*, which I had the honour of passing through the press for the proprietors, Messrs Ridgway, Piccadilly, and of adding Holdich's *Weeds of Agriculture*, as edited by Mr Sinclair, thereto, it strikes me as not irrelevant to add a sketch of Holdich's pamphlet, as neither it nor the *Hortus* may be in the hands of every reader.

The pamphlet was partly written by Mr Holdich while he was

* Two Black-faced wethers, which had attained the very great age of twenty-one years three months, were exhibited by D. Campbell, Esq., younger of Sonachan, at the Highland and Agricultural Society's Show at Glasgow in August 1844.—EDITOR.

editor of the *Farmers' Journal*, about 1800, but had only completed one chapter before he died. Mr Sinclair completed and published it for the benefit of the widow; and eventually the copyright became the property of Messrs Ridgway.

The essay is drawn up in sections, each enrolling the names of weeds whose seeds infest samples of corn—weeds which are difficult to destroy—rampant weeds which impoverish the soil and encumber the crops—and those which are dwarfs, and also those which occur in pastures. The first division includes the Darnel and drank or Ray; then follows the

Cockle, or corn-campion, (*Agrostemma githago*,) most common among barley.* The flowers are handsome, and the capsules, or seed-vessels, are large, and filled with black roundish seeds. These cannot be skreened or sifted out of barley but by means of the cockle-sieve, that is, a brass-wire sieve, having *seven wires in the inch*—a most useful barn article for cleaning seed barley.

Common melilot clover, (*Trifolium melilotus officinale.*)—When this plant is grown and harvested with wheat, its little black pods are seen in the sample, and if ground, the flour is spoiled in consequence of the strong scent and bitter flavour of the pods. The plant, however, is much relished by both cows and horses. The celebrated Gruyere cheese owes its peculiar flavour to the seeds and flowers of this plant being incorporated with the curd before it is pressed.

Tares, (*Ervum tetraspermum et hirsutum.*)—There are two species of wild tares, called the tine-tare and strangle-tare, both pests among corn, especially in wet summers. The pods are not broken by either flail or machine; and much sifting and picking are required to get rid of them out of wheat seed.

Wild oats (*Avena fatua*) are seldom found but on clays and stiff gravels: on loose soils they are but rarely seen. They are easily known by the foxy colour and long awns.

Cleavers, (*Galium aperine*,) or goose-grass, and when the round rough seeds appear in corn they are called burrs. Harrowing the stubbles where it abounds, to bring up a crop of seedlings to be ploughed down in the course of cultivation, is one remedy to prevent increase.

Blackbird-weed, (*Polygonum convolvulus*,) climbing buck-wheat.

Crow-needle, or Venus' comb, (*Scandyx pecten Veneris*,) a common annual weed infesting barley and other corn. The seeds are long and slender, and not easily severed from the sample.

Annual snake-weed, (*Polygonum lapathifolium*,) a very troublesome weed in fenny land, and the bright-black seeds, if seen in samples at market, reduce the value considerably.

Charlock, (*Sinapis arvensis.*)—The seeds of this plant are

* In Scotland it is most common among wheat.—Editor.

common in all kinds of corn, especially oats and barley; but this need not be, as they are easily skreened or sifted out.

Horsegold, (*Ranunculus arvensis*,) the corn butter-cup.—The seeds of this plant, when grown and housed with wheat, appear in the sample, and are with difficulty separated, and, of course, hurt the sale. They are round and flat; concave on one side and convex on the other. The plant is a biennial if sown with wheat in the autumn, but an annual if sown in the spring.

Fallow Weeds, that is, weeds which take such complete possession of the soil as to require a summer fallow to extirpate them. Of these,

The Couch (*Agropyrum repens*) is one of the principal, and in heavy land is a great plague to cultivators. The underground stems are numerous, and divergent in all directions, binding the whole surface together like a mat. The pulverization of the soil, and dragging out the roots and stems upon the surface to be burnt or carried off, are the usual means for destroying couch. Such observations, if given as instruction, are superfluous, as the manner of working and clearing a fallow is universally known; but it is for the sake of stating a fact relative to couch, and that is—it may be killed by repeated ploughing, without the use of any other implement! This is not stated as an insulated fact of one field in any one year, but as a constantly recurring practice for many years over the greater part of an extensive agricultural parish within twenty-five miles of London. The wheat stubbles are first ploughed deeply in the autumn; then athwart twice or thrice in the spring; ultimately drawn out into lands, dunged, ploughed for the last time either in June or July, and sown with turnips, at which last ploughing the couch is all dead and rotten, from having not time to strike root and frequent exposure to the air. If it be heavy land, and intended for autumn cropping, the fallowing process is continued for a month later.

Rest-harrow or cummock, (*Ononis arvensis*.)—This weed has almost disappeared from our fields, and is only met with on wastes or on poor neglected fields. It escapes both plough and harrow, from the extreme toughness and length of its main root, requiring a mattock to grub it up.

Sawwort or way-thistle, (*Carduus arvensis*.)—If this well-known weed gets possession of a field, it is not easily eradicated. It is most annoying to the hands of the reapers, and is every-way injurious. A summer fallow is not always effectual in banishing this noisome plant, but it is the only means which can be employed.

Curled dock, (*Rumex crispus*.)—It is not creditable to any farmer to allow docks to appear either in his arable or pasture fields. They challenge the attention of the weeder, whether among corn or grass, and, therefore, cannot be overlooked.

Tall oat-like softgrass, (*Holcus avenaceus.*)—This is the knotted-rooted couch-grass, which, though admissible in pastures, is a sad plague among corn. It grows in tufts, the stems rising as high as the corn, and the roots consisting of strings of round tubers, by which the plant propagates itself, as every one of which, if broken off by the plough or harrow, becomes a new plant. The best way of extirpating this weed is by digging up the tufts of roots out of the stubble, making a pile of and consuming them with fire.

Coltsfoot, (*Tussilago farfara.*)—This affects clayey or wet loamy land. The roots lie out of the way of the ploughshare, and, therefore, cannot be destroyed by ploughing. The flowers appear long before the leaves; but if both are kept pulled as fast as they appear, and the ground be thoroughly drained, the coltsfoot will soon fade away.

Corn bindweed, (*Convolvulus arvensis.*)—Light sandy soils are usually much infested with this creeping-rooted and climbing-stemmed plant; even fallowing does not kill it—for the least portion of the plant left in the soil will surely take root. Sheep are very fond of this weed, preferring it to every other plant, even before turnips in early spring.

Wild carrot, (*Daucus carota,*) hedge parsley, (*Tortilis infesta,*) common fool's parsley, (*Anthusa cynapium,*) fennel or spingel, (*Meum fœniculum,*) are all field weeds, but easily destroyed by the plough.

Corn mint (*Mentha arvensis*) is often troublesome in wet gravelly fields, and not easily got rid of, in consequence of its easily re-rooting property even after being brought to the surface by the harrows. Draining the land is the only cure.

Surface couch-grass (*Agrostis stolonifera*) is the bastard fiorin, and common knot-grass, (*Polygonum aviculare,*) are both very bad weeds, and detested by the hand-hoer, as they can neither be cut nor drawn out of the soil without excessive labour.

Black-grass, (*Alopecurus agrostis,*) although an annual, often appears among wheat where the culture is deficient, and the soil poor and too moist. It is a child of mismanagement, and a certain sign that the crop, whatever it may be, will be inferior.

Great round-headed garlic, (*Allium ampeloprasum.*)—This is a noxious weed on some of the best wheat-land in the kingdom, viz., deep clayey loams. The bulb lies below the range of the ploughshare, but the stem and head is reaped with the crop, and, if also thrashed with it, the grain smells so strong of garlic as renders it almost unsalable. Luckily the plant is a local one, and by no means plentiful.

Weeds which rob and encumber the land, are charlock, corn-poppy, blue-bottle, mayweed, and corn-marigold.—There are four different species of plants confounded under the name of charlo

or yellow-weed, namely, *Sinapis arvensis*, or common wild mustard; *Sinapis nigra*, black or Durham mustard; *Raphanus raphanistrum*, wild radish; and *Brassica napus*, wild cabbage. These, as well as the others, poppy, &c., are all too well known, and as they are all annuals, are easily killed by aration. But the germination of such small seeds depends very much on the state of the weather and arable surface when the corn is sown. If the autumn be uncommonly dry, and if the ground be harrowed into a very fine and loose condition, and be allowed to remain so all winter, a very numerous birth of annual weeds will come forth in the spring. Hence laying in wheat *heavy* is always recommended.

Theory of Bone Manure. By Mr J. Towers, Member of the Royal Agricultural Society of England.—It is astonishing in how short a time an entire change of opinion may be brought about by circumstances which were not at all foreseen, nor even suspected. Referring to an encyclopædia, in a volume printed in 1836, under the head *Bones* we meet with the following remarks and conjectures :—

"Bones have been of late years very extensively used as manure, especially on *poor lands* and *gravels*." "By their means large tracts of barren heaths have been converted into fertile fields. Most of the bones procured from London and the manufacturing towns have undergone the process of boiling, by which the *oil* and a great part of the gelatine" (or animal jelly) "which they contain have been extracted." "All those who have used bones extensively, report that little difference can be observed. Some give the preference to those from which the *oil and glue* have been extracted; but oil and glue form excellent manure. How is this to be explained?" "The fat and gelatine being intimately blended with the bony matter, and contained in cavities or cells, may remain a long time in the earth without decomposition. As a proof of this, it has been found that bones which had lain in the earth for many centuries, on spots where ancient battles were fought, afforded on analysis nearly as much gelatinous matter as fresh bones would have done."

This remark my own experience has partially confirmed; for, upon opening a vine-bed wherein a quantity of cracked ox and sheep bones had been placed in 1836, I found that eight years had produced no apparent change, other than that of discoloration, owing to the deposition of some oxide of iron, which conferred a brown and yellow tint.

I had heard and read much about the ramification of myriads of fine fibrous vine-roots among the tissue and in all the apertures; but am constrained to confess that, while I traced this ramification from some other vegetable roots, I discovered very few from those of the vine. It is stated that the great effect of bones most likely depends on the phosphate of lime—

"But a closer examination of the fields manured with bones has led us to surmise that much of their importance depends on the mechanical texture of the bone, and on its power of absorbing and retaining moisture; for if a plant which vegetates with peculiar vigour in a field manured with bones be pulled up, it will almost invariably be found that small pieces of bone are attached to the roots; and when these are minutely examined, the smaller fibres of the roots will be found to have

d them, and to pervade their cavities, which will always be found more or less
•
he *moisture*, then, and a small portion of the remaining *gelatine* dissolved in it, e *food* on which the plant has thriven. The more the bones have undergone ntation, the more soluble the gelatine will be. This accounts for the seeming lly of boiled bones—they have undergone a fermentation. The residue, although prived of all its animal matter, is much more porous, and will imbibe and *moisture in its pores*. The food of the plants is here ready prepared and dis- , and kept in store, without being in danger of being washed through a porous evaporated by the heat. The solid substance, which is chiefly *phosphate of* as a stimulating effect"—(how *stimulating*, and what does the expression ?)—" and assists that of the more soluble parts. But phosphate of lime is not in water, and does not decompose readily in the earth; its effect, therefore, so great as to account for the general result. In *stiff* clays the pieces of bone dded in a tough substance, which prevents their decomposition; and in very ils the advantage of these small but numerous reservoirs of moisture is lost, it is easily seen why bones are of less use in such soils."

e above extract, which appears to comprise all that was n, or rather conjectured, of the availability of bones as a re chiefly for turnips, clovers, and pasture grass; and I give t with any view to enlighten the agriculturist, but to demon- e the contracted limits of our information at a very recent d. Four years only from that time had elapsed, when g's Organic Chemistry announced and proved the very , nay paramount, utility of "*trustworthy investigations of the of plants*"—the products of combustion, scientifically con- d, with a view to detect the true *inorganic* constituents of individual.

attempting to present a tolerably clear and accurate view e chemical agency of *bones*, I may claim some authority, as ps I am now the only chemist alive in whose laboratory the *hate of soda* was manufactured, in the large way, for the al practitioners, soon after its discovery and announcement e late Dr Pearson. Before I refer more particularly to a ss which will elucidate the entire theory of bone-manuring, it e right to adduce some facts which have been recorded in ournal of the Royal Agricultural Society of England. There l, in the following short letter from the Duke of Richmond, n a note appended by Mr Pusey:—

the solution of bones in sulphuric acid for the purposes of manure.—My Dear —I have not yet received the details of the experiments tried by the Moray- 'armers' Club with sulphuric acid and bones; but I know that the result has ost satisfactory. On my own farm, which is a light sandy soil, I tried one ith it, another with guano, and a third with stable-yard dung. Early in ber I had a quarter of an acre of each drawn and weighed. The heaviest as from the land manured with the sulphuric acid, though it did not cost me 11s. or 11s. 6d. an acre. I understand also that the turnips came into rough ner on that acre than on any of the others.—Believe me yours sincerely,

ndon, December 9, 1843. RICHMOND."

.—The experiments contained in this letter bears out those of the Moray-

shire Farmers' Club, the details of which appeared in the last Journal, and afford good hope that this, the most important saving which was ever held in the use of manure, will be found generally useful. For those details I must refer to that paper, merely mentioning now that in one trial a bushel of bones, to which sulphuric acid had been applied, exceeded in its effects six bushels used in the common way.

Mr Pusey then alludes to the chemical composition of bones, and takes a view of them corresponding in many particulars with that I have already given in the extract from the encyclopedia. Space will not admit of farther quotations; therefore I will at once come to the practical evidence afforded by the processes of the laboratory.

Premising, then, that ox and sheep bones consist (on the authority of Fourcroy and Vauquelin) of—

	Parts.
Solid Cartilages, Gelatine, and Oil,	51.
Phosphate of Lime,	37.7
Carbonate of Lime,	10.
Phosphate of Magnesia,	1.3
	100.

We have 51 parts which can be *partly* extracted in the forms of oil and size by simple digestion and boiling in water, and wholly decomposed by the agency of combustion. The elements of these 51 parts yielded by combustion, prove them to be oxygen, hydrogen, carbon, and some azote or nitrogen. Now, in our process to obtain Dr Pearson's tasteless purging salt, chemically termed (then *natron phosphoratum*, but now) "phosphate of soda," the bones were placed in iron cylindrical retorts, terminating at the farther extremity in a nozzle, to which were adapted pipes to receive and convey the gaseous and fluid products. The machinery and furnaces, in a word, closely resembled those now employed in the coal-gas works, and the bones were ignited to redness much in the same way as the coals. The liquids obtained were impure ammonia (hartshorn) contaminated by abundance of fœtid animal oil. Here we perceive the union of the elements of water and of ammonia; the former being hydrogen and oxygen, the latter hydrogen and azote. A volume of carbon vapour must also have been extricated, and recombined with hydrogen and oxygen in the animal oil.

When these fluids had passed off, the bones or animal charcoal, then heated to redness, retained their figure, and, if suffered to cool in the retort, would have remained quite black, in the condition of *ivory black*. But the doors of the retort were immediately unluted, and the contents withdrawn as quickly as possible, when, by the attraction of oxygen from the open air, they burst into flame, and the carbon remaining in them was consumed, passing off in the state of carbonic acid gas.

Thus, then, the 51 parts per cent. were disposed of, leaving the 49 parts to be accounted for; but these represented the *inorganic* constituents of the bone.

It is now plain that by boiling and burning we get rid of the elements of humus and of ammonia; and, in so doing, relieve the bone from those substances which coat and entangle it, while they also prevent the operation of the soil and plant-roots upon those other elements which are required for specific purposes.

The *theory of humus* has, from the first, been problematical; and while it was received as the sole interpreter of vegetable nutrition, philosophers and practical men floundered about amidst difficulties and contradictory perplexities. Carbonic acid was referred to as the *sine qua non*, and so long as any substance could be deposited in the land which might be made to yield that gas it was believed that enough was done.

The more recent discoveries have, however, proved that, while farm-yard manure contains an ample store of that decomposing animal and vegetable matter which is finally resolvable into black humus or vegetable mould, applicable to *every soil* and plant, there are other constituents of each individual plant which require specific manures for their especial nutriment. And now, to come to the point at once, if it can be clearly shewn by analysis that a sound well-grown turnip *does* contain bone-ash—that *trefoil* exhibits vestiges of gypsum—and that *lucerne* yields a very considerable portion of *phosphates*—then we can distinctly assert that, be the quantity of humus in the soil what it may, it is utterly incapable of furnishing one particle of those inorganic salts which, nevertheless, must be derived from the soil and not from the atmosphere.

Bones deprived of their decomposible organic elements contain 49 parts per cent. of salts of lime. Now, in order to produce phosphoric acid from these salts, the bones, rendered white by their final combustion, were placed in deep leaden vessels; and so much water was added as completely to cover them with an inch stratum in excess. Concentrated sulphuric acid was then poured with great caution over this water in a small stream, till, in the end, whatever was the weight of the bones, just one half of that quantity of acid was superadded, while a man with a wooden oar stirred the contents of the vessel. The first operation of the acid was to seize the *lime* existing in the form of a *carbonate*—thus liberating, with strong effervescence, a volume of carbonic aërial acid.

In this process, 10 parts of the 49 were, by combining with their equivalent of sulphuric acid, converted into about 11 of sulphate of lime, in round numbers; that is, supposing in every 100 parts of carbonate of lime there are 44 or 45 parts of car-

bonic acid. Artificial gypsum, therefore, was the first product of treating calcined bones with sulphuric acid.

The effervescence having ceased, the remainder of the sulphuric acid was employed in liberating the super-phosphate of lime, by combining with the basal lime of the bone-phosphate, and thus producing a proportionate additional quantity of artificial gypsum or sulphate of lime.

Let any one burn a few bones in a common furnace till they become white, and to one pound placed in a stoneware jar add one quart of rain water, and then about half-a-pound of the strongest sulphuric acid. By slow degrees, and in a few days, if the mixture be occasionally stirred with a stick, the decomposition will be completed, and a thick mass, called, by some writers, "gruel of bones," will be the result. If this mass be put into a jelly bag of coarse linen, a clear pale-yellow fluid will draw off, after which, water should be poured upon the filter till the fluid no longer has an acid taste. The filtrated liquid is the phosphoric acid of the bone, holding in solution a considerable portion of phosphate of lime, while the residuum in the bag is gypsum.

The agriculturist may thus learn what he effects by treating bones with sulphuric acid; for he will discover that he not only obtains a *super-phosphate* of great importance to any crop which contains, and therefore requires, this chemical agent as its peculiar element, but that, in addition, he has acquired a great bulk of that valuable salt called gypsum, (sulphate of lime.)

That the clear liquid is not pure phosphoric acid is readily shewn by heating it in an earthen vessel, and adding, till the hissing ceases, a quantity of carbonate of soda. A copious white sediment will be separated, and the clear liquid will be a weak solution of phosphate of soda, the salt originally announced as a purgative by Dr Pearson. This liquid, evaporated by simmering, will form rhomboidal crystals of phosphate of soda.

I have thus endeavoured to shew in plain terms, without entering into any *atomic minutiæ*, the precise composition of bones. As to the fact alluded to in the first quotation, that "the food of plants is *ready* prepared in bones that have been boiled, and that the roots will be found to have grasped the bones, and to pervade their cavities," it just amounts to, and proves nothing more than, the adhesive pertinacity with which the roots of any plant cleave to the bottom and sides of a porous garden pot. Here they find no prepared gelatine, nothing, in a word, but *diffused* water—moisture so distributed as neither to glut nor swamp the most delicate fibre; and, indeed, so long as the *porous medium* of baked clay can thus be retained in that state of saturation, most plants will thrive with superior luxuriance. As to

soluble in soils, we know nothing of them; every direct
nt evinces that the rootlets, while uninjured, cannot
e smallest particle of even colouring matter, although
lly proved that, by amputation, a woody twig will imbibe
ed solutions, and convey them even to the leaves and
, water, therefore, alone, or holding salts in solution,
potassa, and the phosphates with a saline base, or gases
. by vital agency,) appears, upon the above-cited evi-
be the only *terrene* aliment of vegetable bodies, since,
, it is certain that *humus* accumulates in all cultivated

curring to undecomposed bones, whether crushed,
, small pieces, or to the finest dust, they are so guarded
nimal matters as to resist the energy of either soil or
d, for a considerable period, that even of strong sul-
id. Yet they can be acted upon by that acid; for I
ined phosphate of soda from crude bones. The speedy
minate effect produced upon a crop of turnips, recorded
ike of Richmond and Mr Pusey, depends upon the free
of the *super-phosphate*. Admitting that it is not traceable
nip, while in that condition, it is not the less certain
alk exists in the soil, the salt, which will be formed by
nation with the acid, will still be phosphate of lime,
ing a fresh product, and in an extremely divided state,
tracted and taken up by the roots of the vegetables at
e moment when it is immediately required.
lleges and seminaries, forming now or contemplated, for
ction of rising agriculturists, ought to enter deeply into
rches, and make apparent those facts which, at present,
ed as speculative theories.

*a and the Canadians.**—Notwithstanding the numerous
at have been written on Canada, every emigrant must
the difficulty of obtaining that detailed and practical
on which was necessary to guide him in his movements.
travels are generally too vague and diffuse, and, for the
t, in reference to this colony, they have been the result
mperfect and hasty observation. Compilations from
ain, of which there are several, must necessarily partake of
rfections of the sources from which they are derived.
ks as have been composed by individuals familiar with
have been generally deficient in comprehensiveness and

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f Canada and the colonists; embracing the experience of a residence;
present state, progress, and prospects of the colony; with detailed and
ormation for intending emigrants. By a Four Years' Resident. Edin-
m & Charles Black. 1844.

fidelity—have had reference only to certa[illegible]—or have been biased by the personal interests of their [illegible]. An authentic collection of statistical facts, and a[illegible] servations derived from an extensive survey of the country, a lengthened residence in it, and a familiarity with the ordinary wants and objects of emigrants, as well as the best methods by which these may be met, must, therefore, be a valuable contribution to the stock of information we possess regarding what the author of this work designates the nearest and most attractive of all our colonies, and which Lord Sydenham declares to be the finest country he ever knew. Perhaps this little work might have admitted of improvement in the digestion and arrangement of the materials; but the materials themselves are valuable; and no one, we think, can rise from the perusal of "Canada and the Canadians" without having a very vivid picture left on his mind, both of the appearance of the country and the habits and pursuits of the inhabitants. The conviction of the author is, that, even in the present day, the colony is very imperfectly known in Britain, and that the means of comfort, and the general advantages it possesses in such abundance, as well as its steady and prosperous progress towards becoming a most important and influential country, are much greater than is generally supposed. Recommending the work to all more especially interested in this colony, we must limit ourselves to a few extracts which will enable our readers to judge for themselves respecting its composition and character. The following is an introduction to the town of London, one of those places which have risen up, like an exhalation, in the course of a very brief period in the far west. It is situated on an extensive peninsula formed by the great lakes Huron, Erie, Ontario, and St Clair. The first house was built in 1827, and the town now contains a population of 3,000:—

Approaching it from the east, after having journeyed for above eighty miles from the head of Lake Ontario, the entrance is a somewhat level road through a little piece of wood upon each side. Within this, and on looking around you, the scene presented is a circuit of several miles of "cleared" ground, bounded all round with a fence of thick forest. A confused-like assemblage of wooden houses, of all shapes and sizes, fills up the centre. The pelting rain, making everything look heavy and wet, (it was under such circumstances the author entered London,) hopeful anticipations are taken aback as the eye falls upon the dreary-looking ugly "stumps," and the low-roofed rude "shanties" of the squatters; and while you are yet engaged in ruminating on all sorts of wild and inhospitable notions, the mail-stage, with its four stout steeds, has rattled you up to the door of the chief inn; and not even the bright blazing log-fire, and a substantial and cheerful-looking meal, can make you feel sufficiently at ease respecting the result of all your journeyings and anxious thoughts; and when you retire for the night, ten chances to one but you go to dream of this wild wooden place in the wilderness.

The morning is sunny and bright, a clear blue sky, with tufts of light clouds [illegible]ly reposing; our fellow-travellers and the boarders of the inn are up, quietly [enjo]ying the grateful air, promenading the shaded balcony, rest[in]g themselves on [se]ats, or some of them may be dispersing from the early bre[akfas]t table to resume

ities of the day. The street—the main street of the town, which you agerly to look upon—is quite an animated scene in its way. Shops—of two or three stories—lettered all in front, and with gay windows, 1 varieties of tempting wares, are just much like other shops in your ountry." The shopkeepers are busy arranging and dressing up their ying their printed cambrics, and muslins, and webs of bright handker-d their doors, and even over their upper windows, for the purpose of traction to the farmers, and farmers' wives and daughters, whom you ady dropping into town from the surrounding country, and beginning to arance of stir to the wood-paved, wide, and regular street. Well-dressed, ooking people bustle about, and exchange the pleasant "Good morning" her, so much the custom here; and all doing it so happy like, you cannot ought within yourself that there must be something vastly comfortable le about the place which can present such a scene, and that it may be nd your anticipations of the New World realized after all. You take a d you see neat painted cottages, inhabited by the most industrious and adesmen; and, passing the western end of the street, you suddenly find rlooking, from a high bank, the winding course of the river Thames—. of two branches which flow, the one along the south, the other the undary, of the town. A still higher bank, on the other side of the south tes you to continue your walk, and that you may have a full view of this n. Crossing "Westminster Bridge," a little way on your left, you find the township of the same name, and contemplating, with a pleasing e scene which stretches out before you, a crowded collection of houses—eets all in perfectly straight lines, east and west, and others at right e of the houses mean, others passable, many neat and comfortable, a few, however, fresh and new-like, as if they had but come from the carpen-yesterday, or had by magic risen out of the woods, and made that ample clearance," in which they stand, for themselves. Seventeen years only, ot one bit of clearance there—all was wood, dense forest—yet you now e houses, stately churches, popular institute, and castellated court-house; individuals during that time, inhabitants of the town, have made respect-encies, and many more, finding exercise for their industry, comfortably ly settled for life."—P. 98.

s town the current prices of staple provisions are as —Barrel of superfine flour, containing 196 lbs., from 16s. beef, mutton, pork, veal, from 2d. to 3½d. per lb. When quantities, beef may be had from 12s. to 14s. per 100 lbs.; k from 7s. to 8s., which would make the cost of the bout 1½d. per lb., and of the latter less than 1d. Pota-be stated at 1s., or less, to 1s. 6d. per bushel; butter 5d. per lb.; fowls 6d. to 10d. a couple; geese 1s. to 2s. rkeys 2s. 6d. to 3s. 6d. All the ordinary kinds of vege-s well as fruits, are in abundance. Rents may be said early about what they are in the third or fourth-rate of the new town of Edinburgh, deducting the taxes. A ble-looking house for a small family, with parlour and on the ground floor, and three or four bedrooms above, lar and back-green, may be stated at L.12 a-year. An cottage, with garden behind and shrubbery in front, can for L.30 or L.40 a-year. The average rate of wages for en is from 4s. to 5s. a-day. Board and lodgings are to from 7s. to 10s. per week. The wages of labourers on

the public works, and farm-servants, varies from 28s. to 32s. per month, with board; but, in summer, the wages of farm-labourers are usually about 40s. a-month, with board.

"Wheat is the great staple in Canada, and generally commands a cash market. The price per bushel, upon an average of seven years, has been calculated to be 3s. fluctuating usually between 2s. 6d. and 4s. 6d. The rate of agricultural wages varying in particular districts and seasons, may be stated from 2s. to 3s. a-day; the average produce of wheat per acre, 25 bushels. The cost of transporting a bushel of wheat from the shores of Lake Erie to England, is estimated at 2s. covering all charges. The imperial quarter, which, as stated by Mr M'Culloch, averages in England 57s., contains 9 bushels and 20 lbs. wheat at 60 lbs. a bushel. It appears, then, that the average price of wheat in Canada is 32s. say on the shores of Lake Ontario. On Lake Erie it will be about 30s., and, the cost of transport to England of 23s. 4d., the result will be, that Canada wheat, exclusive of duty, could have been presented in the English market, on the average of the last seven years, at 53s. 4d. a quarter. The cost of transporting a bushel of wheat 20 or 30 miles from the interior to Lake Erie is at present about 6d. a bushel on indifferent roads; but as the roads are improved, which is now being the case, the cost will be lessened."—P. 127.

*Griffith's New South Wales.**—To those who are desirous of obtaining a concise, judicious, and well-written account of the present state of the Port-Phillip district, New South Wales, we cannot do better than recommend this little volume. The writer is a scholar and a man of observation, who has evidently spent a considerable period in an Australian hut, and made himself familiar with the habits and pursuits both of the settlers and aboriginal natives. Many of his remarks appear to us extremely judicious; there is an appearance of impartiality throughout, and a desire to afford to the reader the best means of judging of the eligibility of the colony, both as regards its physical and social condition, as a field for emigration. It is a matter of no small surprise, when we consider the immense interests involved, how late we have been in obtaining correct and available information respecting our distant colonies. How much disappointment and misery might have been avoided had there been, from an early date, same authentic source of intelligence to which, in cases of doubt or difficulty, an appeal might have been made! Even now, however, the information is not too late; and every work written with such care and apparent candour as the present must be hailed as an acceptable offering.

The district of Port-Phillip was occupied as a permanent British settlement only at so late a date as the year 1836, when a few huts were put up for the accommodation of the government officers, on the spot where Melbourne now stands. This town, at the close of 1841, contained a population of upwards of 9

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* The Present State and Prospects of the Port-Phillip District of New South Wales. By Charles Griffith, A.M. Dublin: W. Curry, Jun. & Co. 1845.

The whole of Port-Phillip district contains a population of 20,000 souls, occupying a territory larger than Ireland, for the greater part in perfect peace and security. This population possesses upwards of 1,500,000 sheep, 100,000 cattle, and about 5,000 horses, which yield an export of L.300,000 per annum. This may be considered as the income of the population, giving an average of L.15 a-year to every man, woman, and child. During the eight years this country has been occupied, three towns have been built, namely, Melbourne, above mentioned, Geelong, and Portland.

Many of our readers are aware that, in order to find some outlet for their surplus stock, the Australian flock-masters have for some time been in the habit of *boiling down* their sheep for the sake of the tallow, which they find an available export. The mode adopted is thus described:—

A man selects a number of old ewes from his flock, say 500, and, if necessary, fattens them for some time. These ewes, when in good condition, are driven to one of the boiling-down establishments; they are then slaughtered, and cut up into pieces of a convenient size; the bones are broken, and the whole packed closely in a wooden boiler, strongly clasped with iron: the hind legs being, however, reserved for a different use. Steam is then let on by a pipe constructed for the purpose, and after a few hours the tallow is run off into casks, through another pipe leading from the bottom of the boiler. The refuse which remains in the boiler is then placed in a screw-press, and subjected to a high pressure, until all the tallow has been squeezed out; this is then put into an iron boiler, and refined, previous to being put into casks. The wool is stripped off the skin, washed, and packed for exportation; the trotters are boiled for their oil, and the bones exported to make hafts to knives. No use is yet made of the refuse, except as manure, or to feed pigs, which, in process of time, are to be themselves boiled down: nor is the blood (which would be valuable for the manufacture of Prussian blue) turned to any account; but the thing is as yet in its infancy. The legs are either sold in Melbourne at eightpence each, or else cured and exported to Van Viemen's Land as mutton-hams. An old ewe, weighing about 60 lbs., when treated in this way, will, if fat, yield about 24 lbs. of tallow, worth threepence per lb. in Melbourne. Taking, however, the ewes of the country at 50 lbs., you can, if they are really fat, reckon on 20 lbs. of tallow, worth at the least five shillings.—P. 25.

For engaging in agriculture there exist at present great facilities. Many sections of land, with cottages and out-buildings, and with gardens stocked with vines, fig-trees, peaches, &c., may be at present purchased within ten or twelve miles of Melbourne, on very low terms, probably not more than one-half what was expended in making those improvements in the dear times; and land still better for the purposes of cultivation, within twenty miles of Geelong, and on the banks of the Barwan river, may be purchased in an unimproved state, from private individuals, for about 12s. per acre. In this part of the country there is already a considerable quantity of cultivation, and the crops seem certain. About twenty-five bushels of wheat per acre is, I am told, an average crop, and as much as forty bushels is sometimes yielded. But whether agriculture yields a large per-centage on the capital embarked or not, there is one thing of which a man may be certain, which is, of having every comfort and many luxuries on the cheapest terms. In every part of New South Wales living costs a mere trifle. Flour may be had at L.10 per ton, or ten pounds for 1s.; brown sugar L.16 a ton, or seven pounds for 1s.; white sugar 4½d. a pound; tea L.5 : 5s. a chest, or 1s. 7¼d. per pound; mutton and beef 1½d. per pound. In Melbourne, house rent is very low; excellent brick cottages, with five or six rooms, can be had for from L.40 to L.50 per annum.

We should have been well pleased, did our space permit, to

follow Mr Griffith into the bush, and transfer to our pages some portions of his graphic sketches of a squatter's life. His practical hints to emigrants are full of sound sense, and may be consulted with advantage by every emigrant. The best method of dealing with the Aborigines—a subject attended with great difficulties—he treats at considerable length, and while he points out, in a very convincing manner, the defects of the present laws and regulations relating to that most intractable and brutalised of all savage nations at present known, he throws out many hints for their improvement, which seem to us deserving of much consideration.

*Transactions of the New York State Agricultural Society.**— This handsome and profusely-illustrated volume contains an account of the proceedings of a transatlantic society which corresponds in its objects to the two great agricultural associations of England and Scotland. Along with an account of the proceedings, there are various essays on different subjects bearing on agriculture, and an extensive series of reports in reference to the transactions of county agricultural societies. It is pleasing to observe the exertions that are making in America, not only for the advancement of agriculture properly so called, but also of rural affairs in general. Every endeavour is made to introduce the most approved methods of culture practised in Europe, as well as to discover others which may be better adapted to the American soil and climate. Many of the finer breeds of cattle have long since been imported from Britain; and, judging from the numerous addresses here given, the agriculturists of the western world are animated with a spirit of improvement which cannot fail to lead to the most beneficial results.

After the example of its prototypes, the New York State Agricultural Society holds an annual cattle show *and fair*, which appears to excite a high degree of interest. The meeting, of which an account is here given, was held at Rochester, and lasted for three days:—

> Filled to overflowing (we are told) as was the city, by the multitudes that poured in from every point of the compass, and by every means of conveyance, to witness this great annual farmers' festival, the public hotels were found utterly unable to accommodate all, and private mansions were freely opened, and a generous hospitality abundantly exhibited. The rush of farmers, mechanics, and others, to attend the fair was unprecedented and astonishing; and the interest to the last appeared scarcely abated. Canal boats and trains of cars poured in their thousands daily, and the manner in which the streets of Rochester were blockaded, indicated that every wheel vehicle within fifty miles of Rochester had, by some magician's wand, been at once congregated in the place.—P. 20.

The total number of cattle entered for exhibition was 227; of

* Albany, 1844.

horses 140; of sheep 110. The receipts at the fair, from all sources, amounted to 3,000 dollars. It is interesting to contrast these results with those of similar exhibitions elsewhere.

The longest, most elaborate, and by far the most valuable paper in this volume is a geological survey of New York, by James Hall. It contains numerous views of scenery, fossils, &c. executed on wood; and although it bears marks of having been hastily composed, it cannot fail to prove highly interesting to the general geologist. The paper next to this in length is a treatise on insects injurious to field crops, &c. Harris had previously written a very good book on the injurious insects of America, and we do not see that the present author has done more than add to the information he supplies whatever could be drawn from other sources. He proceeds as if he were opening up new ground—revealing for the first time the secrets of insect life; whereas he is doing nothing all the while but transfusing the sentiments of other writers into his own words, and scarcely at all times even attempting that. And in deriving, without acknowledgment, his information from other writers, he has seldom adverted to the fact, that what holds true in regard to European insects is very seldom applicable to American ones, as most of the latter are specifically distinct. His figures, which are numerous, are copied, also without acknowledgment, from British works, except two or three, which are so bad that we are in no way disposed to dispute their originality.

A paper on the expediency of introducing Highland cattle into America, and another on the manufacture of sugar from corn-stalks, are not without interest. The numerous addresses to agricultural associations contained in this volume are, in many instances, very curious productions, and strongly characteristic of American mind. There is a tone of exaggeration, a loose and unregulated fancy, along with an inflated verbosity of expression, of which it is sometimes difficult to say whether they are most ludicrous or most lamentable. What would a meeting of farmers, in this old and sober country, think, if their president commenced his address to them in such strains as the following? —*loquitur* J. W. Knevels, in the Capitol at Albany:—

The first positive indication to Columbus of his having achieved the discovery of a new world was—A RAY OF LIGHT. After months of perplexing navigation, in a frail bark, and over an untraversed ocean, with a mutinous crew, maddened by repeated disappointments, the undaunted mariner, indomitable in spirit as he was sagacious in judgment, took his accustomed station to watch for the anxiously-anticipated discovery—his keen eye ranging along the dusky horizon in search of that "land" for which he had long and fervently yearned. Suddenly he beheld a *light* gleaming in the distance! That ray was the herald of America! LIGHT! "the bright effluence of bright essence increate," was the auspicious harbinger chosen to announce the existence of the NEW WORLD. Nor has the resplendent augury proved fallacious. Our country has thus far justified the appropriateness of this propitious omen. On

general politics and religion she has shed a flood of light, as a beacon to guide the course of the wandering family of man. She has done her part in science and the arts, in education and jurisprudence. It remains with the present generation to carry out and vindicate her permanent claim to be looked upon as the [illegible] as well as the asylum of the civilised world. In this way alone can her high destiny be accomplished, &c.

ON LIME AND ITS COMPOUNDS, AND THEIR INFLUENCE ON AGRICULTURE.

(*Concluded from page 645.*)

By Mr Thomas Rowlandson, Liverpool.

The preceding observations will, I think, be amply sufficient to prove that the fertilizing effect of lime on lands where free humic acid or its compounds, the humates of potash, soda, ammonia, &c., are present, arises not from (as it is generally believed) rendering such matters in the soil soluble, but, on the contrary, by its combining with the free humic acid and the soluble humates, thus forming the insoluble humate of lime, and setting the potash, ammonia, &c., free. It is well known to all who have had the cultivation of peat and moorish lands—and I may also add those lands termed sour clays, (which always contain a portion of humic acid,) that an application of ordinary farm-yard manure, in however so abundant a quantity, produces very little fertilizing effect, unless there has been a previous application of lime or other calcareous mineral, the reason of which is perfectly obvious, viz. the union of the humic acid of the soil with the ammonia, potash, &c., in the manure, (in which soluble state it is found that these compounds are prejudicial to the most valuable class of plants,) and thus depriving the manure of some of its most fertilizing ingredients.

Having now seen the *mode* in which lime acts on one class of soils, the next question of importance which arises is the quantity which ought to be applied, also the most economical manner of doing so. It must be evident, from what has been stated in this paper, that the chemical action of lime and its compounds can only take place whilst they are in a state of solution. Now caustic (quick) lime rapidly absorbs carbonic acid from the atmosphere, forming the carbonate of lime, in which form it is totally insoluble, being thus converted into the neutral substance, chalk; although it is the exterior of the quicklime which first becomes converted into a carbonate, and thus, in some degree, prevents the rapid absorption of carbonic acid, it must be still borne in mind that the combination of carbonic acid with the lime continues steadily though slowly to proceed, and if left long

osed to the atmosphere, more particularly if much moisture present, the lime gradually crumbles, which, by exposing so h greater and fresh surfaces to the atmosphere, the conver- of the quicklime into a carbonate proceeds much more idly. It is evidently, therefore, of primary importance that should be spread and turned under the soil as speedily as sible, and, could we make certain of the weather, immediately eding a shower of rain would be the most effectual mode of lying it. The most efficient manner would, doubtless, be to quicklime with a large quantity of water, forming what is monly called milk of lime, and distributing the same on the l with an ordinary watering cart, the soil having previously n thoroughly pulverized by proper ploughing and harrowing. en lime, however, can be obtained with ordinary facility, and not too expensive cost, the expense attendant on so labori- an operation would much exceed the saving which might thus nade by making a less quantity of lime suffice for an equal ace of land. In places, however, where lime is procured only difficulty, and at a high price, the preceding observation be of value, as I have seen thousands of acres of land, the luce of which would be increased from 20 to 50 per cent. an application of no greater quantity than 20 bushels per ,* which small amount cannot by any other means be so lly distributed; with respect, however, to peats, I have never id less than 100 bushels per acre suffice, and that only as a application; and, with a shallow furrow, three times that unt ought to be applied to be effectual.

Iaving now disposed of the manner in which lime acts upon , when humic acid or the soluble humates are present, I l now proceed to examine the action which takes place when klime is applied to other descriptions of soils, but more par- larly clays; also the important use to which this substance be applied for the purposes of agriculture in extracting from ral minerals, but principally from felspar and mica, the potash contain. It was first observed by M. Fuch of Munich, potash could be obtained from the minerals containing it, nerely calcining them with lime and then leaving them for e time in contact with water, which was afterwards filtered evaporated. He is stated, in the *Ann. de l'Industrie*, to have ined in this manner from 19 to 20 per cent. of potash from

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The lands alluded to are thin wolds, moors containing much silica and alumina, our clays, where humic acid is present in sufficient quantity to be hurtful, yet abundance. The truth of the assertion will be apparent when the respective c weights of lime and humic acid are taken into consideration—viz., lime 28 umic acid 336. It consequently follows that 1 ton of lime will neutralize 12 of humic acid.

felspar, and from 15 to 16 per cent. from mica; as potash plays decidedly the most important part, as regards amount, of all the mineral constituents of the crops usually cultivated, the above quoted discovery of M. Fuch deserves the most serious attention of the agriculturist, as it is one of the dearest inorganic manures which he can procure, if forced to do so from the exhaustion of his land by previous over-cropping or other causes; and if our farmers were only aware of the greater luxuriance of grass when potash exists in the soil in abundance, they would speedily put the above experiment into practical operation, wherever feasible from the proximity of limestone and the potash minerals. The above quoted discovery of M. Fuch has not been lost sight of by Liebig, as, in his *Letters on Chemistry*, page 135, he states, "The same effect which the lime, in this process, with the aid of heat, exerts upon felspar, it produces when it is mixed with the alkaline argillaceous silicates, when they are for a long time kept together in a moist state." In the same letter he seems to attribute the fertilizing effects of lime on clays to its slowly setting free the silicates. With respect to this latter position, I cannot concede that my own experience corresponds with this assertion, neither does it appear that an abundance of the soluble silicates in the soil has a tendency to add to the produce of grain, but only to the yield of straw; in fact, according to all that I have seen, a large amount of the soluble silicates in the land always appears greatly to lessen the weight and to deteriorate the quality of a grain crop. I am therefore induced to believe that the action of lime on argillaceous soils consists mainly in setting free the potash which they may contain, so that it may be capable of assimilation by cultivated plants.* From these observations it will be seen that the practice of farmers applying lime to clay lands, during the course of their fallow season, is a just and correct one, as the repeated ploughings greatly assist the lime in rendering the previously existing insoluble mineral matters soluble, both by the greater disintegration of the soil and exposing fresh surfaces to the action of the lime and consequent more minute distribution. In proof of the slow but certain

* Liebig states that, if we calculate from these data, (viz. the analysis of Ch. Gmelin, Lowe, Fricke, Meyer, and Ridtenbacher,) and from the specific weights of the different substances, how much potash must be contained in a layer of soil formed by the disintegration of 26,910 square feet (1 Hessian acre) of one of these rocks to the depth of 20 inches, we find that a soil of—

Felspar contains		1,152,000 lbs.	Potash.
Clinkstone contains from		200,000 to 400,000	do.
Basalt	—	47,500 to 75,000	do.
Clay-Slate	—	100,000 to 200,000	do.
Loam	—	87,000 to 300,000	do.

action of calcareous matters in liberating the potash from clay, Liebig adduces the fact that—

In the towns of Flanders, where most buildings are of brick, efflorescences of salts cover the surfaces of the walls, like a white nap, within a few days after they are erected. If this saline incrustation is washed away by the rain, it soon reappears, and this is even observed on walls which, like the gateway of Lisle, have been erected for centuries. These saline incrustations consist of carbonates and sulphates with alkaline bases; and it is well known these act an important part in vegetation. The influence of lime in their production is manifested by their appearing first at the place where the mortar and brick come into contact.

With reference to the above-quoted remark from Liebig, I have to observe that, in the town where I reside, (Liverpool,) which, I may state, is built wholly of bricks, (the exceptions at least being extremely rare) this constant efflorescence is not observed; on walls, however, exposed to the western wind, and subsequent to heavy storms, an efflorescence is observed, but generally in the centre of the surface of the brick, and not round the edges. On the western side of the western wall of the Prince's Dock this efflorescence is very distinctly visible, and if hot and dry weather happens immediately to succeed a heavy storm, the wall appears as if it had been whitewashed. It is, therefore, evident that, in the case of Liverpool at least, other conditions are requisite to assist in decomposing bricks than the aid of lime. It has been distinctly proved, in many instances, that lime slaked by salt water benefits the land on which it is applied more than if slaked by ordinary spring-water. May not this effect be traced to the same cause as is seen to occur at the wall of the Prince's Dock, Liverpool, viz., the more rapid decomposition of the clay, in consequence of the presence of the saline ingredients of the sea-water assisting the lime of the mortar in this process? This is the most probable reason for accounting for the same; because in Liverpool we never observe these incrustations except on walls exposed to the sea: and that a true decomposition does take place is certain; because, on scraping a little of the incrustation from off the wall, and placing the same on the tongue, we do not discover the taste of common salt, but one cooling and saline, similar to that of nitrate of soda or potash. That either of the two named salts may be formed in this manner, is very probable, as it is well known that the presence of calcareous matters assist in forming the nitrates.

After quicklime has been for sometime applied, the whole will have combined with carbonic acid and formed the carbonate of lime, in which state, chemically speaking, it has become reconverted to a substance precisely similar to chalk, marble, or limestone, all of which are merely carbonates of lime. Marls owe their fertalizing properties to the amount of carbonate of lime which they may contain, whether that consists of chalk or limestone gravel. I have no doubt that the cost of applying calca-

reous matters to the land in the state of carbonate is quite equal to that of quicklime. In stating this, I do not allude to the first cost alone, but include the charges for labour and carriage incidental to the operations of marling, chalking, and applying calcareous sea-sand. Nothing can be more certain than that for any matter to produce a chemical effect upon the soil, or to become food for plants, it must previously be in a state of solution. Now the carbonate of lime is quite insoluble in pure water; it is therefore, evident that lime in the state of carbonate can only exercise a mechanical effect upon the soil on which it may be applied. Although, however, the carbonate of lime is insoluble in pure water, it is rendered soluble in water containing carbonic acid, combining, at the same time, with an additional atom of carbonic acid, and forming the bicarbonate of lime, which is soluble in about 1500 times its weight of pure water. We here see the reason why quicklime acts so much more powerfully than chalk; for quicklime is soluble in 780 times its weight of water, whilst the carbonate is not soluble at all, and the bicarbonate only in 1500 times its weight of water saturated with carbonic acid; the latter condition being one which cannot always exist—for although from the experiments of Cavendish it follows that 100 volumes of water (under the ordinary pressure of the atmosphere) are capable of absorbing 107 volumes of carbonic acid, it must be kept in remembrance that the atmosphere only contains 1000th part of its weight of carbonic acid, and the water existing in soils can only become saturated from this source through the limited surface exposed to its influence. Another source whence the water of soils may derive a considerable, and, under favourable circumstances, very probably by far the greatest quantity of carbonic acid, is the gradual decay of pre-existing, and the exuberant or useless fibres of, growing plants; but, on the other hand, we must deduct from this source the quantity of carbonic acid absorbed, together with water, by the roots of living plants, which in many cases, I have no doubt, nearly equals the amount of carbonic acid formed by the decay of vegetable matters. Taking this latter deduction into consideration, it will be found that the amount of carbonic acid available in soils, for the purpose of converting the insoluble carbonate into the soluble bicarbonate is extremely small, and fully accounts for the slow action of the carbonates of lime. From a cause operating by preventing the formation of carbonic acid in the soil, we see the reason why calcareous manures are not so efficient on soils saturated with moisture as on those in which a perfect system of drainage exists. It has long been considered singular that the application of lime or other calcareous matters to infertile soils, from which the superfluous water had been drained, was attended

so much greater beneficial effects to that of an application on of a like nature, but undrained. The true rationale of the tion is this: Stagnant water existing in a soil prevents the sion of the oxygen of the atmosphere, and its conversion carbonic acid in combination with the carbon of decaying s, thus leaving the sole supply of carbonic acid to be derived the atmosphere; and as a large portion of this will be ab- d and assimilated by the growing plants only, a very small nt of carbonic acid can be left for the conversion of the car- te into the bicarbonate of lime. The action of the bicar- te, as well as all the soluble salts of lime, on soils containing ic acid, or the soluble humates, is the same as lime itself.

licate of lime.—There exists in the mineral kingdom a quan- of limestones, called water mortar limestones, in consequence eir property when burned of hardening under water. In such s a considerable portion of the lime is in combination with c acid, (quartz silex, or sand.) I have previously given my ons for believing that a sufficiency of silicates exist in most . On peat bogs newly reclaimed, perhaps, the silicates might und useful, as it has been known that oats grown for the first on such lands have drooped, in consequence of silicic acid ch forms the exterior covering of bamboo-cane and straw) g absent.

lloride of calcium, commonly known as muriate of lime, has in the last few years attracted some attention as a fertilizer. easily prepared by pouring muriatic acid upon chalk, slaked , or the softer limestones and marbles, (on highly indurated stones and marbles, muriatic acid produces scarcely any ible effect, unless finely pulverized,) until the acid becomes rated, when there will be produced a very deliquescent salt bitter taste, viz., the chloride of calcium. A still more econo- l mode of preparing the same for husbandry purposes is to refuse or other salt with quicklime, which mixture, if left r cover for a few months to the alternating effects of moist dry weather, a double decomposition will gradually take e, the chloride of calcium and carbonate of soda being ed, the latter salt, efflorescing, may be gathered when in cient quantity. Scheele was the first chemist who observed effects produced when salts of iron or lime were mixed with salts, and justly attributed the same to the fact of the onate of soda having the property of efflorescing and chrys- zing by the evaporation of a smaller quantity of water than er lime or iron salts: in other words, the carbonate of soda s less affinity for water, and is less deliquescent. When, how-

ever, the converse of this is performed, viz., the mixture of solutions of carbonate of soda and muriate of lime, the mutual decompositions are precisely the reverse, viz., the carbonate of lime is precipitated, and the muriate of soda (common salt) is held in solution. This apparent paradox (by no means an unfrequent one in chemical operations) may be explained in the following manner:—Muriate of soda is a very soluble salt, and attracts moisture in a high degree; lime is only soluble in about 750 times its own weight of water; the moisture attracted by the muriate of soda dissolves a small portion of lime which, under certain circumstances, (to be alluded to hereafter,) has a greater affinity for muriatic acid than soda, thus forming muriate of lime and hydrate of soda, the latter being speedily converted into the carbonate by attracting carbonic acid from the atmosphere. It is also highly probable that, at the same time, another decomposition takes place, viz., (a portion of lime is converted into bicarbonate, in which case the carbonate of soda and muriate of lime is formed with the evolution of one atom of carbonic acid, which may be supposed either to enter into combination with one atom of lime, or it may combine with one atom of soda—thus setting free one atom of muriatic acid, which would immediately form one atom of muriate of lime. This latter supposition is founded on the property which most recently formed substances have of entering with greater facility into new, and sometimes almost improbable combinations. It is evident from the whole of the phenomena attendant on the changes alluded to that the affinity (under certain circumstances) between muriatic acid and soda, and carbonic acid with lime, is nearly balanced. Under such circumstances, we may easily conceive that the nascent atom of carbonic acid may enter into combination with the soda in the manner described. It has been previously shewn that, on mixing solutions of carbonate of soda and muriate of lime, the resulting compounds are muriate of soda and carbonate of lime. It is necessary, therefore, to shew under what circumstances muriate of lime is formed by mixing calcareous matters with common salt. In the first place, it is indispensable that the mixture be not too dry, otherwise no chemical action will take place; in the second place, if too moist, a similar inactivity between the different substances will exist; also, if the whole becomes very wet, after a mutual conversion *has taken place*, the muriate of lime will again become converted into the muriate of soda, by coming in contact with the carbonate of soda. This, however, is in a great degree prevented, in consequence of the carbonate of soda having the property of efflorescing, and, by the means of capilliary attraction, being gradually drawn to the surface of the mixture, and, consequently,

' the influence of the muriate of lime, which, on account of liquescent properties, has exactly the opposite tendency— o sink in a liquid state to the bottom of the mass. It will, 'ore, be clearly seen that, on procuring muriate of lime by ixture of salt and lime, unless the carbonate of soda is 'ed as it is formed, that, after being applied to the land, :st shower of rain will convert the whole into the original tuents—viz., muriate of soda (salt) and carbonate of lime. ə gone to some length in treating of the formation of muri- ' lime by mixing lime and salt, because it, at the same time, ates the mode in which this substance acts in fixing ammo- When carbonate of ammonia is procured by pouring a ɔn of muriate of ammonia (*sal ammoniac*) into a retort con- g some chalk, (carbonate of lime,) and applying heat for time, the resulting compounds will be found to consist of te of lime and carbonate of ammonia. It must be borne in nbrance, however, that these results are obtained through ;ency of heat: at ordinary temperatures, little change takes If, however, we pour a solution of carbonate of ammonia , solution of muriate of lime, at ordinary temperatures, we find that carbonate of lime is formed and precipitated, and te of ammonia is held in solution. This is the mode in Liebig conceives that the muriate of lime acts beneficially ıps—viz., by what is commonly termed fixing the ammonia ɔd from the atmosphere or other sources. Taking Liebig's on as correct (and it has every appearance of being so) :ting the amount of carbonate of ammonia which descends ; earth in rain in the course of twelve months, and seeing ıportant results which follow the application of nitrogenous ɔunds, it behoves the agriculturist to take every means in ɔwer to derive all the advantages likely to take place by the same in his fields. No substance will do this so readily ; muriate of lime, in consequence of its great solubility; ,t the same time, it ought to be applied from this quality ɔntly, yet, at the same time, sparingly. I shall conclude my 'ks on this substance (muriate of lime) by observing that ost beneficial mode of applying it to the land is partly as a ,te and partly by applying lime and salt. By applying te of lime, we shall be certain of always having that sub- ; present; whereas, by the application of lime and salt, the te of lime will only be present in dry weather, (unless, as ɔusly observed, the carbonate of soda is removed.) As, how- soda enters more or less into the composition of all our cul- d plants, it is obvious that, although the muriate of lime d by the decomposition of salt can be of little service (only ı commencement of a shower of rain) in fixing the ammonia

existing in rain water, yet it must be of certain utility in the following manner—viz., when dry weather sets in, the same chemical transposition takes place so fully described previously—that is, the carbonate of soda and muriate of lime are formed—the carbonate of soda being in a state the best adapted as food for plants, the absorption of which will no doubt be greatly facilitated by the great powers possessed by the muriate of lime in absorbing and retaining moisture, thus keeping the land on which it is applied comparatively moist. Liebig speaks slightingly of the benefits derivable from the powers of the muriate of lime in absorbing moisture, stating that a few pounds more or less of water on an acre of land can be of little consequence. This, however, is overlooking the fact that it is not the *few pounds* extra of water which the muriate of lime may be the means of retaining at *any one time*, but the circumstance that, during dry weather, it will retain not only a considerable degree of moisture during the day-time, but by absorbing water from the dews of night, must inevitably conduce to retain some portion of the inorganic food of plants in a soluble state during the greatest droughts; and, as the losses of the day will be invariably repaired by the absorption of moisture from the dews of the evening, we may conceive that, during a prolonged period of dry weather, instead of the muriate of lime only retaining a few pounds, it may, in this manner, absorb some tons extra of moisture which otherwise could not be obtained. Many complaints were made last summer respecting guano not being found to answer expectation, which was, in several instances, accounted for by the want of rain. If so, it is highly probable that, had a little muriate of lime been mixed with the guano, the complaints respecting its failure would not have been so prevalent. The humates decompose this substance as well as all the soluble compounds of lime.

Sulphate of lime or *Gypsum*.—This substance, which is a compound of sulphuric acid and lime, is found in abundant quantities in a native state, both for the purpose of agriculture and the arts, and it has been recommended for the same purpose as the muriate of lime—viz., the fixing ammonia; but is infinitely inferior for that purpose, in consequence of its difficult solubility; at the temperature of 60°, one part of gypsum only being soluble in 460 parts of water, to obtain which, however, the gypsum must be finely divided, and macerated for a great length of time. Its more obvious use in agriculture is, however, as a direct food to certain plants, either as supplying the sulphate of lime, or, by its decomposition, affording the sulphur necessary to the due development of certain plants, such as the crucifera, &c. The following table, extracted from "Sprengel's Analyses," shows the quantity of lime

nd magnesia, sulphuric and phosphoric acids, in 100,000 parts n several of our ordinary crops:—

	Lime.	Magnesia.	Sulphuric Acid.	Phosphoric Acid.		Lime.	Magnesia.	Sulphuric Acid.	Phosphoric Acid.
Wheat, . . .	96	69	50	406	Wheat Straw, .	240	32	37	170
Barley, . . .	106	180	59	210	Barley do. . .	554	76	118	160
Oats, . . .	86	67	35	70	Oat do. . .	152	22	79	12
Potatoes, . .	33	32	54	40	Red Clover, . .	584	70	94	138
Cabbage, . .	1822	202	774	430	Beet, ...	285	133	123	107
Swedish Turnips,	835	282	890	408	Turnips, . . .	127	22	41	73

The above table may not be strictly accurate, but I believe it pproximates to the truth, and certainly agrees with my own ractical observations respecting the exhausting powers of different rops on various soils. Cabbages are known to be one of the nost scourging crops that is grown, and we see from the above able that both it and Swedes require a large amount of the ulphate of lime; the next is red clover, and the application of gypsum to the clover crop, on lands sparingly endowed with this ubstance, has been so repeatedly treated of, that it is an act of upererogation to enlarge on its usefulness.

Phosphate of lime.—Of all the compounds of lime none, of late years, have so much attracted the attention of chemists and agriculturists as this substance. It forms the principal constituent of bones, which contain about 55 per cent. of phosphate of lime, and about 33 per cent. of gelatine. When bones became of general use as a manure, many disputes arose whether their fertilizing properties consisted of the gelatine or the phosphate of lime. In the first instance, public opinion sided with gelatine; with a great number of writers (at the head of which is Liebig) at the present day, all the benefits derived by the agriculturists from the use of bones are referred to the phosphate of lime. For my own part, I believe the greatest fertility is produced when nitrogenous substances are present as well as phosphate of lime; and according to the account of Professor Daubeny, (see last Number of Journal, p. 686,) the phosphorite rock in Estramadura does not appear to impart any degree of fertility to the adjacent soil. The remarks made respecting boiled bones are not at all pertinent to the question unless the same had been boiled in a Papins' digester, and the *whole* of the gelatine extracted. With regard to ordinary boiled bones, there is every probability that they may, in the *first instance*, produce a more exuberant

fertility, as, by extracting some of the gelatine from the exterior and harder parts of bones, it, by that means, presents a greater surface to the action of air and moisture, causing a more rapid decomposition than would otherwise take place. If we take into consideration the properties of phosphate of lime, it will soon be perceived that phosphate of lime *per se* cannot exercise the uncommon fertilizing quality which its admirers attribute to it. In the first place, two good crops of Swedes of 22 tons each or one crop of 44 tons,* is about the equivalent of 100,000 lbs.;† 30 bushels of bones contain about 920 lbs. of phosphate of lime or about 460 lbs. of phosphoric acid. By the preceding table we find that 44 tons of Swedes contain 408 lbs. of phosphoric acid, or, (as I presume, the leaves were not included by Sprengel in the preceding analysis,) about an amount equal to that contained in 30 bushels of bones, leaving only 52 lbs. for loss. Assuming that the phosphate of lime is soluble in 1500 times its own weight of water,‡ it would require 620 tons of water to dissolve the same. When it is further taken into consideration that bones are usually drilled at spaces 24 and 30 inches asunder, and 12 to 18 inches in the row, it will be found that such an enormous amount of water can in no case come in contact with bones in the ordinary course of agriculture. When we notice, also, bones laying in streams for years without disappearing, we must feel convinced that some other cause must operate to render bones or other phosphates soluble in the course of agricultural operations. The carbonate of ammonia tends to render phosphate of lime more soluble, solutions of the muriate and sulphate of ammonia will hold a still greater amount of phosphate of lime in solution. Common salt holds about the same quantity in solution as the muriate and sulphate of ammonia; but I have found that equal portions of muriate of soda, (common salt,) muriate of ammonia, and sulphate of ammonia mixed together, hold the greatest quantity of phosphate of lime in solution. From these remarks it will be apparent that the higher commercial value set upon such guano as contains the greatest amount of nitrogenous compounds is perfectly correct, even admitting that it is the phosphate of lime which forms the principal food plants derive from that article; they also shew that, in order to obtain the greatest benefit from substances containing the phosphate of lime, we should also drill, or otherwise use, along with phosphates such substances as will tend to render them soluble. In materials containing both nitrogenous compounds and phosphates it

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* Upwards of 40 tons of Swedes have sometimes been obtained from a statute acre of land in the vicinity of Liverpool.

† 100,000 lbs. are 44·68 tons.

‡ I am by no means certain that phosphate of lime is so soluble as here stated.

›e useful to use a small amount of sulphate of lime and
ite of soda, which, by decomposing the carbonate of ammo-
s it is formed by the putrefactive fermentation which takes
in such articles as bones, &c., would, at the same time, form
t which would hasten the solubility of the phosphates. From
experiments recently made, I am of opinion that the phos-
c acid in guano does not exist as a simple combination with
Amongst other spots where guano may possibly be ob-
d in the British isles, I may mention Ailsa Craig. About
een years ago the writer was laughed at, on passing that
lar rock, for mentioning that he thought the person who
; on it might derive a pretty income from the exuviæ of the
which congregate on that spot in such numbers.

trate of lime is the most soluble salt known at 60°, one part
ter dissolves four parts of this salt. It would form, I have
›ubt, a valuable manure, especially for grass-lands, and might
epared from our ordinary manure. To treat on the matter,
uld require to enter into the question as to the best mode of
ng manure heaps and liquid-manure tanks, and, therefore,
l occupy too much space.

AGRICULTURAL REPORT.

February, 1845.

ns being to us a short quarter of only two months, we have
nuch to say in regard to field operations, and especially at this
of year. The ploughs were laid idle for about three weeks in
mber, in consequence of the frost, which at times was very
se—the thermometer decending to nearly zero. To the frost
eded a period of mild weather during the greater part of
ary, accompanied with occasional showers of rain. Advan-
was very properly taken of mild and dry weather, by the
judicious farmers, to store as large a quantity of turnips
ey could effect, to await the exigencies of a snow-storm when
›uld arrive. Besides this incentive to storing turnips in the
part of winter, there is the advantage of having them in the
juicy state, and at that point of ripeness in which the sap
nes most dormant, before it is again put into a state of
ity by the approaching vitality of spring. It has now been
tained beyond doubt, by direct experiment, that turnips
d at an early period will retain their nutritive property
e month of June; and also that the land from which the
ps have been early removed yields a larger and better
of grain than from that which had been occupied by turnips

to a late period of the spring. As long as the weather continued open, turnip-land was ploughed and spring-wheat sown in excellent order. From the latter part of January to the middle of February frost has prevailed and snow has fallen again and again, and have again disappeared under gentle thaws.

Having of late moved much about the country, we were glad to perceive the young wheat looking healthy, and, though not far advanced, possessing a vigour which will not be easily checked. The young grass, too, is looking well, and the ground seems well planted. The turnips as yet have withstood the frost well, and it is generally remarked that stock have not thriven on them better than they are now doing for many winters past.

It will be seen by the Tables that the prices of all kinds of grain have remained very steady, and that the difference during two months amounts to only 6d. per quarter for wheat—a remarkable state of the market for both buyer and seller.

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of January 1844 and 5th of January 1845—shewing the Increase and Decrease on each head thereof.

	Quarters ending Jan. 5.		Increase.	Decrease.	Years ending Jan. 5.		Increase.	Decrease.
	1844.	1845.			1844.	1845.		
	l.	l.	l.	l.	l.	l.	l.	l.
Customs,	4,566,969	4,902,135	135,167	. .	19,073,219	20,378,072	1,3[illegible]	
Excise,	3,090,771	3,290,940	200,169	. .	11,794,807	12,160,111	[illegible]	
Stamps,	1,523,653	1,601,658	78,005	. .	6,429,155	6,611,[illegible]	[illegible]	
Taxes,	1,368,827	1,880,490	511,673	. .	4,190,490	4,2[illegible]	[illegible]	
Post-Office,	143,000	146,000	3,000	. .	592,000	635,000	43,000	
Miscellaneous,	42,017	59,190	17,173	. .	1,762,241	[illegible]	. .	[illegible]
Property Tax,	454,415	487,541	33,126	. .	5,249,764	5,1[illegible]	. .	[illegible]
	11,329,681	12,307,954	978,373		49,079,168	50,081,997	[illegible]	[illegible]
	Deduct Decrease,		[illegible]		Deduct Decrease,		[illegible]	
	Increase on the Qr.		978,273		Increase on the Year.		1,0[illegible]79	

FOREIGN MARKETS, per Imperial Quarter, free on Board.

Date.	Markets.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1844. Dec.	Dantzig.	27/6 to 31/6	19/6 to 23/	9/6 to 12/6	18/6 to 22/	23/ to 25/6	22/6 to [illegible]
1845. Jan.	..	28/ 32/6	19/ 22/9	9/ 11/	19/ 22/	24/ 26/	21/6 [illegible]
1844. Dec.	Hamburg.	28/ 32/	20/6 24/	10/6 12/6	19/6 22/	24/6 27/6	[illegible]
1845. Jan.	..	25/ 33/6	19/9 23/	11/6 13/3	19/ 22/6	24/6 26/	[illegible]
1844. Dec.	Bremen.	35/ 37/6	19/6 24/6	10/6 12/6	18/ 22/6	24/ 26/	[illegible]
1845. Jan.	..	34/6 36/6	19/ 24/	10/ 11/6	17/6 22/	23/ 27/6	[illegible]
1844. Dec.	Konigsburg.	32/ 36/	19/ 22/	12/ 14/6	20/ 24/	25/ 29/6	[illegible]
1845. Jan.	..	30/6 35/	18/6 21/6	11/6 14/	19/ 2[illegible]	24/ [illegible]	[illegible]

Freight from 3/6 to 5/6 per Quarter to Great Britain.

TABLE OF PRICES, &c.

...ge Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the follo... Markets:—

LONDON.

...heat.		Barley.		Oats.		Rye.		Pease.		Beans.	
...	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
9	2	35	10	23	9	31	2	36	6	36	0
8	5	35	4	23	1	31	9	35	4	36	4
8	7	35	4	23	3	32	4	34	6	35	4
0	4	35	7	23	7	32	6	35	4	35	1
9	7	35	6	24	5	31	8	36	6	35	9
8	6	36	5	23	9	33	2	36	2	34	2
9	4	36	1	22	10	33	6	35	8	34	3
8	6	35	6	21	10	32	8	35	10	34	0

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.	
1844.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 4.	47	6	31	4	20	1	37	2
11.	47	4	31	9	20	2	36	8
18.	47	0	32	4	20	9	37	0
25.	46	11	32	2	20	4	36	0
1845.								
Jan. 1.	46	6	31	2	21	6	35	8
8.	46	10	31	6	21	6	35	0
15.	47	0	31	2	21	7	35	2
22.	46	6	31	3	21	4	35	4
29.	46	2	30	6	21	4	36	0

LIVERPOOL.

...heat.		Barley.		Oats.		Rye.		Pease.		Beans.	
...	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
4	7	32	8	21	9	32	4	34	9	38	0
5	8	34	1	21	3	32	6	35	6	37	6
5	5	32	4	23	9	38	2	36	4	38	9
4	5	31	0	23	4	31	8	36	10	39	2
8	4	34	7	23	0	31	4	36	6	34	5
5	6	34	6	21	8	32	1	35	8	36	9
5	0	35	6	21	5	33	2	34	10	33	10
5	5	35	1	21	10	32	0	35	9	38	5

DUBLIN.

Date.	Wheat per Bar. 20 st.		Barley per Barrel 16 st.		Bere per Barrel 16 st.		Oats per Barrel 14 st.	
1844.	s.	d.	s.	d.	s.	d.	s.	d.
Dec. 7.	24	10	15	5	12	6	10	7
14.	25	7	16	4	12	4	11	3
21.	25	0	16	0	13	6	11	4
28.	26	10	16	8	14	0	12	0
1845.								
Jan. 4.	25	5	17	0	14	3	11	10
11.	26	10	16	6	13	0	12	0
18.	26	2	16	10	13	6	11	5
25.	26	1	16	7	13	0	11	8

...owing the Weekly Average Prices of GRAIN, made up in terms of 7th and ...d 5th Vict., c. 14, and the Aggregate Averages which regulate the Duties ...GN CORN: the Duties payable thereon, from December 1844 to February 184o.

Wheat.				Barley.						Oats.						Rye.						Pease.						Beans.			
Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Agg... Av...	
s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
45	10	20	0	34	9	35	5	3	0	21	10	21	7	6	0	31	2	33	4	9	6	36	4	35	7	7	6	37	5	37	1
45	8	20	0	34	5	35	2	3	0	21	11	21	9	6	0	32	0	32	6	10	6	36	1	35	9	7	6	36	9	37	[illegible]
45	6	20	0	34	2	34	11	4	0	21	10	21	9	6	0	32	0	32	1	10	6	35	4	35	11	7	6	36	11	37	[illegible]
45	4	20	0	34	9	34	8	4	0	20	10	21	8	6	0	31	9	31	8	10	6	35	5	35	10	7	6	36	7	37	[illegible]
45	5	20	0	34	5	34	4	4	0	21	7	21	8	6	0	31	4	32	0	10	6	36	0	35	11	7	6	35	[illegible]	[illegible]	[illegible]
45	6	20	0	34	7	34	5	4	0	21	8	21	7	6	0	31	5	32	1	10	6	35	8	35	9	7	6	35	[illegible]	[illegible]	[illegible]
45	4	20	0	34	2	34	6	4	0	21	10	21	8	6	0	33	9	32	2	10	6	36	1	35	10	7	6	36	[illegible]	[illegible]	[illegible]
45	7	20	0	34	2	34	4	4	0	21	3	21	6	6	0	32	11	32	2	10	6	36	2	35	9	7	6	36	[illegible]	[illegible]	[illegible]

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quan Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Qu upon which duties have been paid for home-consumption, during the same Month; and the tities remaining in Warehouse at the close thereof, from 5th December 1844 to 5th January 18

Month ending	IMPORTED. From Foreign Countries.	From British Possessions.	Total.	CHARGED WITH DUTY. From Foreign Countries.	From British Possessions.	Total.	REMAINING IN WAREH[OUSE]. From Foreign Countries.	From British Possessions.
Dec. 5, 1844.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, .	20,865 7	1,376 5	22,242 4	14,536 6	1,380 0	15,916 6	364,120 1	157 7
Barley, .	80,027 2	52 5	80,079 7	65,587 1	52 5	65,639 6	21,363 1	. .
Oats, . .	21,058 7	0 5	21,059 4	30,670 7	0 5	30,671 4	74,755 4	. .
Rye, . . .	1,501 4	0 2	1,501 6	14,854 5	0 2	14,854 7	4 7	. .
Pease, .	927 4	2,118 2	3,045 6	2,005 3	2,118 2	4,123 5	7,009 3	0 2
Beans, .	12,088 5	. .	12,088 5	4,001 3	. .	4,001 3	8,969 5	. .
Totals,	136,469 5	3,548 3	140,018 0	131,656 1	3,551 6	135,207 7	476,222 5	158 1
Jan. 5, 1845.								
Wheat, .	15,068 2	4,590 6	19,679 0	12,502 7	3,827 1	16,330 0	361,229 0	921 4
Barley, .	104,187 5	175 3	104,363 0	128,139 4	175 3	128,314 5	2,464 0	. .
Oats, . .	18,647 7	631 0	19,278 7	17,778 6	631 0	18,409 6	74,483 0	. .
Rye, . .	7 1	. .	7 1	7 1	. .	7 1	4 7	. .
Pease, . .	2,170 6	3,511 7	5,682 5	1,530 6	3,512 1	5,042 7	7,304 4	. .
Beans, . .	14,764 1	. .	14,764 1	10,116 2	. .	10,116 2	13,442 7	. .
Totals,	155,165 6	8,909 0	164,074 6	170,075 0	8,145 5	178,221 5	458,928 2	921 4
Dec. 5, 1844	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, .	6,161 1 6	41,413 3 15	47,575 0 21	1,770 1 8	40,164 3 4	41,935 0 12	250,993 3 6	14,628 0 5
Oatmeal,	95 1 1	27 0 0	122 1 1	. .	27 0 0	27 0 0	103 0 19	2 0 0
Totals,	6,256 2 7	41,440 3 15	47,697 1 22	1,770 1 8	40,191 3 4	41,962 0 12	251,096 3 25	14,630 0 5
Jan. 5, 1845.								
Flour, . .	8,914 2 26	17,573 2 27	26,488 1 25	261 3 8	24,500 3 11	24,762 2 19	254,989 2 10	7,701 3 21
Oatmeal,	15 2 3	96 2 6	102 0 9	. .	86 2 6	86 2 6	118 2 22	2 0 0
Totals,	8,930 1 1	17,660 1 5	26,590 2 6	261 3 8	24,587 1 17	24,849 0 25	255,108 1 4	7,703 3 21

PRICES of BUTCHER-MEAT.

Date.	LONDON, Per Stone of 14 lb. Beef.	Mutton.	LIVERPOOL, Per Stone of 14 lb. Beef.	Mutton.	MORPETH, Per Stone of 14 lb. Beef.	Mutton.	EDINBURGH, Per Stone of 14 lb. Beef.	Mutton.	GLAS[GOW], Per Ston[e] Beef.
1844. Dec.	5/9 to 7/9	5/6 to 7/6	5/6 to 7/0	5/9 to 7/3	5/3 to 7/	5/6 to 7/3	5/ to 7/	5/3 to 7/	5/3 to 7/3
1845. Jan.	5/6 7/9	5/9 7/9	5/9 7/3	5/6 7/3	5/6 7/3	5/6 7/6	5/3 7/3	5/3 7/3	5/6 7/6

PRICES of English and Scotch WOOL.

ENGLISH, per 14 lb.			SCOTCH, per 14 lb.	
Merino, ...	15/ to	21/	Leicester Hogg, . .	16/ to
in grease, . . .	13/6	17/3	Ewe and Hogg, . .	12/6
South Down, ...	17/	20/6	Cheviot, white, . . .	12/
Half Bred, ...	13/6	16/6	Laid, washed, . .	9/
Leicester Hogg, . . .	16/	20/	unwashed, . .	7/6
Ewe and Hogg, . .	12/6	15/6	Moor, white, . . .	6/
Locks, ...	7/	10/	Laid, washed, . .	5/
Moor, ...	6/	8/	unwashed, . . .	4/6

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